PROGRAM TO DEVELOP EFFICIENCY IN VISUAL FUNCTIONING

NATALIE C. BARRAGA, *Directing Editor*
JUNE E. MORRIS, *Project Director*

Source Book on Low Vision

American Printing House for the Blind, Inc.
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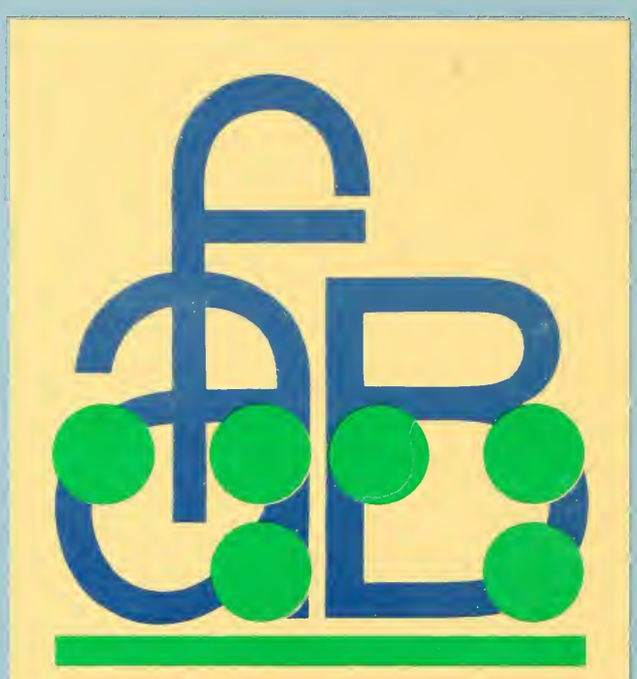

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Introduction

This *Source Book on Low Vision* serves two purposes:

- It is an integral part of the *Program to Develop Efficiency in Visual Functioning.* It provides background and practical suggestions for working with low vision learners. Included in the Source Book are appendices listing supplementary materials that can be used to complement the lessons in the program—an invaluable aid for vision specialists and teachers.
- It is an introduction to low vision instruction and can be used as a college text or as a refresher course. Parents and regular classroom teachers who are working with low vision learners will find in it answers to many of their questions.

At the present time, approximately 80% or more of the population of visually handicapped children, youth, and young adults have some usable residual vision. In fact, recent surveys (Genensky, 1978) estimate that there may be as many as 180,000 school age individuals with visual impairments who could improve visual functioning if impairments were identified and attention given to helping them become more efficient in visual tasks. Increasing numbers of adults who are losing vision may be taught adaptive means of functioning in order to maintain greater degrees of visual efficiency.

Although low vision persons generally constitute the majority of visually handicapped people in any setting, they may have little time and attention directed to their specialized needs in learning how to look and make use of remaining vision for functional purposes and every day living activities. There may be a tendency to teach only "blind techniques" since learning to be blind may take less time and energy on the part of the learner as well as the instructor. Such practices are often a poor substitute for preparation of personal and vocational pursuits throughout life. The learning or work required to use low vision with all possible efficiency is difficult, and progress is sometimes slow, but for most individuals it is well worth the effort. However, a very important fact needs to be kept in mind: no person can function visually beyond the level of perceptual development and general mental ability at a point in time. There is a continuous overlap between cognitive development and the expectation for efficiency in visual functioning. The process of developing efficiency in visual functions also promotes cognitive development many times because of the integrative nature of the visual sense.

People representing many disciplines are associated with low vision individuals or provide services in a variety of settings. Instructors in educational or rehabilitation settings, along with those who work with parents or in assessment procedures may or may not have received specialized preparation for work with visually handicapped persons. Often, questions are raised about visual functions, normal visual behavior, and diseases or conditions affecting the eye. Professionals in many disciplines are interested in the attitudes and philosophies surround-

ing the use of low vision and wish to refer to summaries of research evidence as they become more closely involved with low vision individuals. Teachers and other instructors are concerned often about lighting and visibility factors, magnifying devices and other low vision aids, and the type of materials most appropriate for use with low vision learners. When the placement of visually handicapped students in regular classrooms is a new experience for regular class teachers and administrators, requests for information and suggestions about low vision learners may become a part of the communication and interaction with vision specialists.

Although none of the topics mentioned above are covered in any depth in this book, many of them are discussed briefly in the succeeding chapters. In addition to the seven chapters, appendices include a variety of information which may be of value to readers who use the program or pursue topics in greater depth. These include (a) lists of supplemental commercial materials coded for easy reference to sections in the lesson sequence of the *Program to Develop Efficiency in Visual Functioning*; (b) a complete bibliography of research articles on low vision and other sources of related information; (c) a glossary of terms not defined in the text itself; and (d) sources of materials for vision reduction simulation.

I

Historical Background

Prior to 1960, there were many reports in the literature that some so-called "blind" people could actually see and were doing such remarkable things as reading and holding jobs requiring the use of vision. Jones (1961) presented evidence that about 60% of the "legally blind" children registered at the American Printing House for the Blind in 1960 were using print as a primary reading mode.

In the United States, legal blindness is defined as "visual acuity for distance vision of 20/200 or less in the better eye with best correction or field vision no greater than 20 degrees" (National Society for the Prevention of Blindness, 1966, p. 10). No controlled research studies, however, had been completed which showed what visual tasks besides reading could be performed or which variables or characteristics influenced the use of low vision.

Following the first published study by Barraga in 1964, other studies related to use of low vision were reported before 1970 (Ashcroft, Halliday, & Barraga, 1965; Holmes, 1967). A national effort to disseminate and implement these findings in classrooms for visually handicapped students was launched in 1969 in the United States through cooperation of the Bureau of Education for the Handicapped and the American Printing House for the Blind (Kederis & Ashcroft, 1970). This project resulted in publication of the *Utilization of Low Vision Kit* (ULVK), which contained a Teacher's Guide and the Visual Efficiency Scale (VES) (Barraga, 1970). Additional research and development efforts have continued as others applied the principles of visual stimulation and development (Apple, O'Brien & Blasch, 1970; Hull & McCarthy, 1975; O'Brien, 1971; Tobin, 1973; Tobin, Tooze, Chapman, & Moss, 1977).

An extensive evaluation of the published materials and the special study institutes which had been held throughout the nation (Ozias, 1975) indicated the need for expansion and revision of the *Utilization of Low Vision Kit*. A grant was secured by the American Printing House for the Blind from the Division of Innovation and Development, Bureau of Education for the Handicapped, to accomplish the revision. The following objectives were outlined: (a) to revise and expand the teacher's materials into a Design for Instruction (DIP), (b) to revise and expand the Visual Efficiency Scale into a Diagnostic Assessment Procedure (DAP), and (c) to develop a list of basic commercial materials and provide materials for student use. The Program to Develop Efficiency in Visual Functioning was a result of that project.

The following reprints of articles present a review of recent literature and the rationale for development of the *Program to Develop Efficiency in Visual Functioning*.

Development of Efficiency in Visual Functioning: A Literature Analysis

Natalie C. Barraga
Marcia Collins
James Hollis

Abstract: *Analysis of recent literature covering visual experiments with infants and young children documents a progression of visual functions in early development. Summaries of studies of individuals with seriously impaired vision suggest that principles which apply to visual development are as valid when the system is impaired as when there is no impairment.*

Note: *This literature analysis was completed as a part of the research for Revision of the Low Vision Kit, Grant No. Goo-76-05-1-18 awarded by the Bureau of Education for the Handicapped to the American Printing House for the Blind, 1839 Frankfort Avenue, Louisville, Kentucky, 40206.*

The first research findings documenting that visual efficiency could indeed be improved in children with seriously impaired but remaining usable vision through a planned learning program were published by Barraga in 1964. Basic facts were organized from many disciplines, such as perceptual psychology, learning theory, medicine, and education. Synthesis of these ideas with classroom observations and experiences led to conceptualization of the possibility of a process of visual perceptual development in visually handicapped children approximating the pattern found in children without impairment. Replications of the original study, using a variety of commercial and teacher-made materials, with school age children have verified the effectiveness of planned learning experiences to promote efficiency in visual functioning (Ashcroft, Halliday, & Barraga, 1965; Holmes, 1967; Tobin, 1973).

Concern has been expressed by those working with very young children and those who have multiple impairments in addition to visual problems for more appropriate evaluation and instruction procedures at lower levels of visual functioning, and some work has already begun (Hull & McCarthy, 1973; O'Brien, 1976; Wilson, McVeigh, McMahon, Bauer & Richardson, 1976). Application of the same theoretical principles as those used with children has been extended to rehabilitation settings where adults are using distance perception and other visual cues in movement and travel (Apple & May, 1971; Barraga, 1976; Blasch & Apple, 1976; Oppel, Pascuzzi, Pikowsky, Williams, & Moore, 1977).

Continuing efforts are indicative of increasing concern in educational and clinical communities for efficient use of functional vision in persons of all ages regardless of eye condition or diagnosis. No diagnostic evaluation process or design for instructional plans presently available is appropriate for all age groups or for all functional purposes. The American Printing House for the Blind has received

research funds for revision of the Low Vision Kit (Barraga, 1970), and work has begun under contractual arrangement with Dr. Barraga and a research team at The University of Texas of Austin to develop a comprehensive program.

As a basis for establishing a theoretical rationale for this challenging task, literature in all aspects of visual functioning was analyzed. Recent information about visual behavior in young children, multihandicapped individuals, and adults with low vision has suggested new ideas about the functional capacities of low vision persons. Even when severe visual impairment is present at birth or is diagnosed early in life, there is sufficient evidence to infer that development of vision, both optically and perceptually, generally follows a sequence similar to that found in children with no impairment. Youth and adults who have never used their low vision for functional purposes or who have had vision restored by medical procedures are visually underdeveloped both optically and perceptually.

Progression in Normal Visual Development

The vast range of capabilities of the visual system in infants as well as children and adults is indicated throughout the literature. The normal sequence of visual development is characterized by an emergence of various behavioral and physiological patterns. Functional abilities appear in a consistent but fluctuating order. A succession of functions provides a framework from which to compare the visual development of individual children even though impairments in the system may be present.

In the first five years of life, the progression of normal visual development flows freely from one function to another, merging and overlapping with each other. A specific visual function may appear early or late or reappear periodically before becoming stablized. The intensity and variation in stimulation for looking influences development in the visual and visual motor systems.

All neural systems are immature in early infancy, and the optic nerve is incompletely myelinated; peripheral components of the visual system mature earlier than the macula area within the retina. Although foveal vision is functional to some extent at birth, it may be less developed, a fact which accounts for the suggestion that only movement and gross form are perceived (Appleton, Clifton, & Goldberg, 1975; Bronson, 1973; Haith & Campos, 1977). Even so, infants become aware of many visual sensations and begin to take in lots of visual information.

The ciliary muscles are weak and cannot control fixation, so objects are not in focus. The low vision person who has never tried to use vision experiences similar lack of control and blurs in vision. At this primitive level, light from any direction produces reaction, and bright light causes pupillary constriction, a reflex dependent on light reception of the retina and optic nerve.

The normal visual acuity of the newborn has been estimated to be 30/440 to 20/150 with accommodation possible at seven and one half inches. In a matter of weeks, the infant begins to attend to novelty and complex patterns, can discriminate mother from a stranger, and a human face brings a smile (Haith & Campos, 1977). The eyes can soon fixate and track a slowly moving object two or three feet from the face. Density of pattern and high contrast in objects attract attention for longer periods (MacKeith, 1969). Fixation and refixation of moving objects at about two or three feet with reasonably smooth eye movements is observed, and after binocular vision begins to develop, the eyes follow moving persons.

Accommodation at various distances increases the ability to see moving objects eight to ten feet away. Poor accommodation may reflect limits on sensitivity rather than adaptability (Segal, 1974), and is characteristic of those with impaired vision.

Reaching toward objects is indication that discrimination and recognition of the environment is occurring, and that some degree of depth perception is possible at about five inches (Appleton, et al. 1975). Virtually adult-like flexible accommodation and capability of convergence at three inches is soon noted, and looking consumes much time and reflects the onset of "volitional control" of direction of gaze based on memory from prior experience. Development of this intentional scanning and tracking calls attention to spatial and positional patterns to be interpreted when previously only isolated elements were meaningful (Bayley, 1969; Bronson, 1973; Illingworth, 1966).

Babies stare at and examine hands and anything in them with apparent fascination. Eye-hand coordination is developing when smaller objects such as pellets are picked up and studied carefully (Griffin & Sanford, 1976).

As the fovea continues to develop, acuity sharpens to about 20/200, and binocular vision and color perception become stabilized. Accommodation permits objects to be pursued visually in depth from near to far. Reaching for a toy with one hand and good aim, looking back and forth from one object to another, and turning the head after dropped objects reflects improved visual-motor coordination. Visual motor schema of eye-hand and eye-object are integrated with the tactual-motor schema since variations in surface texture, weight, and temperature are also noticed.

New Visual Behaviors Discrimination and recognition of contour and detail in two dimensional pictures, and memory for what has been seen previously are indications of rapidly progressing visual development. Looking and seeing are accompanied by movement and action, as many new visual behaviors begin to emerge, such as: looking for and trying to recover a dropped object; smiling and vocalizing to self in mirror; attention to increasingly smaller sizes and details; watching scribbling; and recognition of partially covered objects. The fovea continues to develop and acuity sharpness reaches approximately 20/100.

Body movements in response to visual stimuli increase now that accurate convergence is swift. Awareness of position of objects in space and their relationship to another is indication that visual perceptual development becomes more integrated with social and cognitive development. Better integration of spatial information and stability in object constancy is reflected by compensation for distance in size estimation, such as size discrimination of doll shoes from own shoes across the room (Griffin & Sanford, 1976; Haith & Campos, 1977; O'Brien, 1976; Segal, 1974).

Normal visual functions in early childhood are constantly changing and expanding. All types of visual games are played, and visual imitation is at its peak. Scribbling is spontaneous, and pictures of familiar objects are found in books and matched to similar toys. Imitation of a two-block tower and placement of a square shape in a form board reveal refined eye-hand coordination.

Ability to discriminate, recognize and perceive a wide variety of figure elements, contrasting areas of figure-ground intensity, near-far perspective, and a logical sequence of actions depicted in pictures is now possible. Expansion of the visual world through independent mobility and experimentation with toys, puzzles, pictures, and books occurs rapidly from this point.

Development shifts dramatically during this phase from physiological control of the eye movements, accommodation and convergence, and refinement of sharpness and clarity of visual acuity to that of visual perception. Like acuity, perception depends on the integrity of the whole retina and the cortical connections (Ffooks, 1969).

Visual memory is evident when children look for missing toys, match color cubes, and name pictures of familiar objects. Soon, details in pictures as well as size differences are observed, and pointing appropriately to specifics in pictures when asked "where" and "what" get to be a game (Lillie & Harbin, 1975).

During the rapidly expanding period of visual development between three and four years of age, organization of visual perceptions overlaps and merges with specific functional refinements. Further development of visual memory facilitates the differentiation and recognition of the whole from a part and vice versa, as well as perception of partial elements in relation to the whole. Organized visual perceptions are emerging when identifying likenesses requires only cursory explorations indicating that things are seen in their entirety at a glance. Only a sample of the available information, limited spatially to one distinctive one, is extracted (Vurpillot, 1976).

By four years of age the child has more completely mastered eye-hand coordination, exercising visual control of exploration and manipulation. By five and beyond, the child is able to discriminate, recognize, and perceive likenesses and differences in abstract figures and representations such as complex designs and numeral and letter symbols (Lillie & Harbin, 1975; O'Brien, 1976).

Talking about relationships between such abstract figures and real objects or their pictures fosters increased visual interpretation. Subsequently, instantaneous visual association is made between real objects, pictures of them, and the numbers and letters related to them. The use of large symbols makes visual recognition easier, and attention can be directed to analysis and interpretation of the individual numbers and letters. Letters grouped into words and short sentences continue to be recognized, even though their size may decrease. Copying symbols indicates the refinement of visual-motor or eye-hand coordination necessary for handwriting, a fact that is true also for those with low vision.

Visual Impairment and Low Vision

Sensory deprivation in the first years of life due to visual impairments may inhibit structural and functional development of the retina and the visual pathways to the brain. Likewise the visual receiving area in the brain remains underdeveloped since maturation of the total visual system is dependent on visual experiences (Woodruff, 1973).

The lack of maturation and development of the visual system may result in a reduction of visual information usable by the low vision person of any age. The quantity and quality of incidental visual learning is limited and the range and scope of visual functioning is restricted without extensive teaching (Barraga, 1976). Persons with low vision may receive many visual impressions, but without the opportunity to ask questions about them or discuss them with a normally seeing person, valid visual perceptions cannot be organized and remembered.

A large population of children with severe visual impairments who were enrolled in an early childhood program were studied by O'Brien (1976). The children were said to come to the educational setting fearful, understimulated, and with limited individual learning experiences and personal skills. Those children with clinical reported acuities from light perception up to 20/200 (distance) acuity were those who needed and profited most by the visual stimulation provided.

A survey of school age children who were visually handicapped showed that less than one third had no useful vision; one third had 20/100 distance acuity; the other one third had varying levels of useful low vision. More than one half of those who were "legally blind" could be considered primarily as sighted children for educational purposes. More than two thirds of these low vision children were thought to need assistance in making maximum use of their residual vision (Hatfield, 1975).

When studying the visual motor integration of low vision children, Kraetsch-Heller (1976) found that their greatest difficulty in visual perception was associated with disproportionate features in space, position in space, three-dimensional representations, and composite forms. A group of low vision

children was studied by Carroll and Hibbett (1973) to determine any possible relationship between clinical acuity assessments at both near and distance and visual perceptual ability. No significant relationships were found for either, although there was a slight correlation between visual perception and near vision. The major conclusion was that the greater the impairment, the earlier the child needed special educational services and visual stimulation if cognitive development in relation to capacity were to progress—an ideal suggested also by O'Brien.

The visual aspects most difficult to perceive by low vision persons of all ages are those which relate to depth, movement, objects or materials against similar backgrounds, objects in poor light, distinctive details in forms and within figures, body movements of others, and specific features within a wide field (Apple & May, 1971).

Visual Acuity and Visual Functioning Controversy regarding definitions and meanings of visual acuity continues among clinical specialists and other professionals. Some tend to be concerned only with central acuity, but Dreyer (1974) says that when we confine the term "visual acuity" to "central visual acuity," only a fraction of the total visual capacity is being considered.

Visual acuity has been exaggerated in importance according to Faye (1976), who says there is no precise measurement for functional acuity, and that is the crucial concern for the person with low vision. To test only distance acuity and to ignore near acuity is to do the person a disfavor since the ability to recognize letters of a given size at a distance bears little relation to practical life situations. She advocated that children who could read the 20/20 line at one foot or at six inches should be recorded as having 20/20 acuity at a particular distance. Not only does such as assessment foster a more positive attitude in the parents and the child, but is a more accurate indication of a person's functional vision. Diagnosis tells little, if anything about the visual capabilities, especially in a young child.

Near vision assessment when impairments are present was emphasized also by Dekkers (1976) who found that there was no correlation between distance vision and ability to use a low vision aid in adults; however, a strong relationship was shown between reading vision and patient success with low vision aids.

Assessment of visual functioning in young children with impairments is difficult at best (Seidenburg, 1975), but a fairly accurate estimate can be made by rotating an optokinetic drum in front of the eyes and noting the motion of the eyes which gives indication of the presence of vision. Unless there is absolutely no indication of visual response, the child should be considered to have low vision and be examined regularly.

A functional evaluation made by teachers prior to clinical assessment of multihandicapped children was advocated by Langley and DuBose (1976). Such an evaluation by the teacher gives an indication of where to begin in planning educational programs, and minimizes the fear, inattentiveness and inconsistent

responses shown by the children. After some instruction and support in learning activities at which they can be successful, a clinical assessment could be more reliable and give more definitive information upon which to base future planning for possible prescriptions of lenses or low vision aids.

Because functioning and efficiency are contingent on physiological, psychological, intellectual, and environmental factors, they are likely to be unique to each person. Hence they "cannot be measured or predicted clinically with any accuracy by medical, psychological, or educational personnel" (Barraga, 1976, p. 16).

Magnification and Optical Aids Magnifying devices and prescription optical aids have received increasing attention from both clinicians and instructors as a valuable means of increasing the use of functional vision and efficiency in both near and distant visual functions. Numerous non-prescription magnifiers may be useful to various students; teachers selecting magnifiers for classrooms may find several considerations helpful:

1. The distance from the material the aid will focus
2. Possible distortions near the edges
3. The number of letters or words that can be seen in succession (Farrar, 1971; Fagerstrom, 1971).

Studies of various magnifying devices have indicated both advantages and disadvantages of most of them, but what is considered a positive factor by some students may be viewed as a negative factor by others, so that no conclusive statements can be made.

Prescriptive optical aids for near and distance use are receiving more and more consideration for school-age low vision students. Friedman (1976) feels that the use of distance aids in the classroom may be of more crucial concern than use of near prescriptions or magnifying devices because they put the child in touch visually with more of his environment both in the classroom and on the playground. This prevents some of the visual experiential deprivation often related to developmental lag found in many visually handicapped children.

Working with students in using magnifying devices and prescribed optical aids, Carpenter (1976) found that the self-image of students changed from that of a blind person to that of a sighted person; reading medium changed from braille to print; students changed from listeners to readers; and actions changed from dependence to independence. She emphasized the importance of a positive philosophy and psychological support among the regular class teachers and the specialists/consultants.

Lighting and Visibility Factors Controlled levels of lighting with low vision students has not received objective study, but empirical evidence suggests that lighting needs and visibility varies with individuals, the natural or artificial light conditions, and the type of task being performed. When surroundings are too

bright or too dark the ability to see may be reduced. Legible printing on matte paper with good lighting provides optimal conditions for reading (Guth, 1971). To provide ultimate contrast for any task, the light should be concentrated on the task or material, and should be at a higher level of intensity than the surrounding illumination. High levels of footcandle power in diffused light may be acceptable for less precise tasks, but most ineffective for visibility of detail.

Reading with Low Vision

Philosophies and practices in learning to read fluctuate from year to year possibly by whim or bias more than by virtue of objective findings. Groff (1974) found that teaching children to match individual letters rather than words was more effective in readiness preparation. Matching, discriminating and recognizing the individual letters had a significant effect on the rate at which children learned words.

Reading for all persons has two major aspects: discrimination and recognition of the symbols, and giving meaning to the thoughts represented by the symbols. Learning to read visually when impaired vision makes it difficult to discriminate and recognize the symbols may raise many questions with teachers and others. A possible way to minimize the problem is to design a more concentrated readiness program to strengthen preparation of preschool children three to six years of age for beginning academic work (Hull & McCarthy, 1973; Wilson, et al. 1976).

Primary objectives of Hull and McCarthy were to develop visual perception and visual efficiency, prepare for beginning reading experiences, and gather evidence for determination of appropriate reading media. Early in the year, all of the children needed reassurance in visual activities and much repetition and help in performing visual tasks. By the end of the year, all were working independently, interested in looking, and well oriented visually. Wilson et al. (1976) worked with 15 children who had a variety of eye conditions and some had emotional, neurological, and hearing problems. The primary objective was to stimulate interest and motivation in "learning to see." Several pre- and post-evaluation procedures indicated that all the children showed marked improvement in efficiency in visual functioning.

After the learning to read process has been mastered, use of low vision may continue to present questions not easily answered. Whether to provide large or standard print, and whether or not to encourage use of magnification are issues raised frequently. Objective information regarding the relative effectiveness of standard and large print with or without magnification in facilitating reading skills of visually impaired print readers was sought by Bock (1971). Whether or not the student used magnification or did not use it with standard print made no difference in reading speed. There was some indication that use of large print by children with higher recorded acuities had a negative effect on reading profi-

ciency. Generally, children have not been taught to use magnification, and most low vision children using large print probably could use standard print if given appropriate aids.

As far as is known from the evidence available at the present time, learning through an impaired visual system occurs slowly, but follows the same sequential pattern as visual development in a normal system. After present visual functions have been evaluated, an intense program of visual stimulation with carefully sequenced activities under appropriate lighting conditions can help individuals of all ages to improve visual functioning at all distances, and for all tasks in real life situations. ■

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Development of Efficiency in Visual Functioning: Rationale for a Comprenhensive Program

Natalie C. Barraga
Marcia Collins

Abstract: *The rationale for a comprehensive program in visual functioning is based upon an assumed interaction between: (a) functions performed by the visual system, (b) developmental visual tasks organized in keeping with perceptual/cognitive milestones, and (c) a variety of indoor and outdoor environments.*

Note: *This second in a series of articles was completed as part of the development and research for Revision of the Low Vision Kit, Grant No. Goo-76-05448 awarded by the Bureau of Education for the Handicapped to the American Printing House for the Blind, 1839 Frankfort Avenue, Louisville, Kentucky 40206.*

The literature in normal visual development was analyzed in an earlier article (Barraga, Collins, & Hollis, 1977) as a basis for discussing visual functioning in individuals with impairment and low vision. An assumption stated at the conclusion of that paper is the basis for the present discussion:

> As far as is known from the evidence available at the present time, learning through an impaired visual system occurs slowly, but follows the same sequential pattern as visual development in a normal system. (p. 390)

Development of the visual system in low vision persons is seldom, if ever, automatic and spontaneous. A process of visual stimulation and learning to look in a variety of environments is paramount to meaningful use of low vision. Individuals may demonstrate "a recorded visual acuity of light perception and later show some useful vision" (Seidenberg, 1975, p. 119).

Even when impairment is present in the visual system, the sequence of development in functioning is known to be compatible with perceptual/cognitive development and maturation factors in each individual. However, patterns are likely to emerge quite unevenly, especially when the impairment is severe, and will be influenced by many individual characteristics such as: (a) the nature and extent of the impairment, (b) age and mental capacity, and (c) provision of encouragement and opportunities for learning to use vision in everyday activities. Some children and adults may have such severe visual impairments that even they and those around them are unaware that improvement in visual functioning is possible until a specialized learning program has been provided (Ashcroft, Halliday, & Barraga, 1965; Barraga, 1964; Holmes, 1967; O'Brien, 1971).

Key terms to be used in the presentation of a rationale may be given various meanings among persons in different professions or disciplines depending upon their purposes and what they wish to communicate. In order to try to avoid confusion, definitions of terms are given in the box on pp. 20-21. Readers may refer to them and understand just how they were used in this discussion.

Any rationale for improvement of efficiency in visual functioning may consider several variables, including: (a) the basic visual functions related to use of the eye and the visual system, (b) the selection of progressively more difficult visual tasks in keeping with perceptual/cognitive developmental milestones, and (c) the diversity in visibility of indoor and outdoor environments.

Visual functions seem to develop in a pattern which may be influenced by three primary factors: (a) the type and scope of visual stimulation and experiences available to promote looking, (b) the variety of visual tasks actually performed under all environmental conditions, and (c) the motivation and capacity for consistent, progressive development both perceptually and cognitively.

The potential for development of visual functions is present when light can enter the eye(s) directly or by being reflected to the eye(s) from objects. Visual functions begin to interact with the general pattern of development in relation to experience in performance of visual tasks in many and varied environments. When no impairments are present in the eye and/or other parts of the visual system, the developmental process is given little consideration because it occurs spontaneously. However, this cannot happen so readily when any part of the eye or visual system is damaged. Detailed identification of all visual functions necessary for maximum efficiency, along with specification of visual tasks related to developmental milestones, provides a basis for design of a program to promote efficiency. These functions and tasks are presented in the matrix on pp. 16-19, along with pertinent considerations regarding the experiential environments. The fact that the matrix is laid out in three roughly linear columns — designating visual functions, visual tasks in normal developmental milestones, and experiential environments — could imply a horizontal relationship, which cannot be assumed. There is a definite interaction between functions, tasks, and environ-

ments, but no specific correspondence has been verified. The organization in each column is from simple to complex according to the identified components, but should be read separately rather than across the page.

The range of visual functions shown in the left column may be divided into three major components: optical, optical and perceptual, and visual perceptual. Optical functions are those which are associated primarily with physiological control of the external and internal muscles of the eye(s) and whose purpose is to facilitate fixation, tracking, accommodation, focus, and movement. When there is impairment or disease in the tissues or structures, these functions cannot develop as easily. Also, the manner in which the muscular skills develop may be quite irregular. In fact, several functions may seem to occur simultaneously, or one function may become smooth whereas others fluctuate by appearing and disappearing from day to day. In low vision individuals, some optical functions can be performed in certain situations but not in others because of the nature of the impairment or disease or the visibility characteristics of the environment.

The second group of functions may be designated as both optical and perceptual because they are interdependent with each other in development. Rather than thinking of these functions as occurring sequentially, it is more logical to think of them as interacting with each other continuously as specific visual tasks are performed. As optical functions become smoother and more stabilized, perceptual interpretration is enhanced. As discrimination and recognition (interpretation) begin to develop, looking becomes more intense, and the more looking, the more refined and skilled the optical functions become. As more and more discriminations are made, recognition begins to occur. As soon as visible objects/people are recognized, the visual memory function begins, and identification (naming) follows shortly. The involvement of the motor system in (a) movement while looking or (b) watching moving objects facilitates spatial perception. Interacting with visible objects by handling, manipulating, and positioning them fosters important function of visual-motor coordination.

The last group of visual functions are identified as visual perceptual. Stabilization of the basic optical skills and development of perceptual understanding are necessary for efficient visual performance. The visual perceptual functions such as figure-ground differentiation, visual closure, and part/whole and whole/part relationships, and visual associations require efficiency in identification and perception of relationships between all types of visible objects/materials. Interpretation and organization of visual information becomes the major challenge. Recalling what something looked like, relating one visible object/symbol to another, recognizing objects/symbols in poor contrast or lighting conditions, and organizing discrete visual information into a synthesized pattern all indicate efficient use of vision for learning and for functioning.

The development and refinement of visual functions can never exceed the level of perceptual/cognitive development of the individual. For this reason, the center

column shows a sampling of representative visual tasks compatible with the normal developmental milestones established through experimental research [discussed in Barraga, Collins, & Hollis (1977)]. These tasks are organized in eight sections identified as A through H, and follow a sequence related to perceptual/cognitive development (Gibson, 1969; Uzgiris & Hunt, 1975). The names of the sections and the explanations give an idea of the general nature of the visual tasks specified within each category. The highest level visual tasks in Section H are commensurate with normal visual perceptual development expected at about six or seven years of mental age.

Word of Caution A word of caution is in order at this point. Although this rationale is based on knowledge of progressive development in unimpaired visual systems, no assumption can be made that low vision persons of *any* age will be able to perform all of the visual tasks, nor in the sequence presented. In fact, each task will have to be attempted, and support and assistance given before performance can be assumed. Even then, development may not occur in the expected sequence. For this reason, the development of efficiency in performance of visual tasks by low vision persons has no relationship to age if the person has never had the other hand, tasks in sections E-H (see pp. 18-19) could not be expected to be performed by individuals whose mental developmental level is less than three years.

Performance of some of the visual tasks may come about very slowly, and may overlap with some of the tasks in an earlier section. Others may appear to develop rapidly or spontaneously and independent of specific learning experiences. Ability to perform some tasks may remain rather primitive for a long period regardless of the visual stimulation and the motivation of the individual to look. In some cases, a visual task attempted many times before will be performed when least expected.

Design of any program to promote visual efficiency must consider the environmental conditions under which the person tries to learn to function visually. The column on the right in the matrix discusses the many variables related to experiential environments. Consideration must be given to providing an opportunity to perform visual tasks in all possible environments both day and night, under different lighting and weather conditions. Although the specific visual functions and the visual tasks in normal developmental milestones are related closely to each other, every aspect of both may occur in any of many environments; some will emerge more rapidly in one environment but remain at a very minimal level of development in another environment or under different conditions.

Low vision persons have unique characteristics and adaptive capabilities which influence the performance of visual tasks when environmental conditions change. This makes designing an overall program a difficult task; no one program can

Visual Functions		Visual Tasks in Normal Developmental Milestones
Optical Response to light Visual awareness Focus Fixation Tracking Horizontal Vertical Circular Accommodation	**Sec. A. 1-3 mos.**	*Optical Functions:* Show awareness of visual stimuli and give indication of receiving visual information. Respond visually to light/reflecting object Move eyes to search and explore visually Attend visually to pattern Look at complex pattern/human face Swipe at/reach toward object
	Sec. B. 4-12 mos.	*Optical Functions:* Develop and strengthen voluntary control of eye movements. Begin to select and discriminate color and shape in concrete objects. Focus and refocus on light-reflecting and colored object (shift gaze) Fixate on concrete object/person with complex shape, unique line arrangement, and/or bright color Track moving concrete object/person of variable size and color intensity Imitate observed gross body movements Select and move to concrete object at increasing distances Maintain visual contact with moving object

Experiential Environments

In early stages of visual development, optical functions are related to motor control stimulated by looking. All experiential environments are appropriate for creation of general visual awareness so long as things to look at are distinctive and close enough, in optimal light, to permit the individual to be aware of them visually.

Opportunity to practice a variety of visual tasks selected from the developmental

Optical and Perceptual Discrimination of: Light, dark, intense color, and contour Gross shapes, lines, and angles Shapes, colors, sizes in concrete objects Pictures of objects and people Recognition and identification of: Faces, people, and colors Shapes of concrete objects, and pictures of objects Details in concrete objects and pictures of objects Likenesses and differences in abstract figures Symbolic representations	**Sec. C. 1-3 years**	*Optical and Perceptual Functions:* Through exploration and manipulation, discriminate, recognize, and use concrete objects for intentional purposes. Move body within specified area and distance Manipulate concrete object in relation to self, other object and from verbal instruction Scribble/mark with pen/brush Match concrete geometric objects by shape Recognize/identify distinctive features in concrete objects/people (e.g., circle, nose, arm, clothing) Select/identify specific concrete objects/people Assemble parts of concrete objects Manipulate concrete objects to match model	milestones within all environments will help to strengthen and refine visual functioning for real life experiences. The outdoor environment in the yard, neighborhood, parks, playground, and streets provides a myriad of contours and shapes, a diversity of objects to explore visually, and the full range of light and dark contrasts. Such experiences help to develop flexibility of visually guided behavior in an uncontrolled environment. The indoor environment in homes, stores, schools, and
	Sec. D. 2-4 years	*Optical and Perceptual Functions:* Discriminate and identify shape and detail in pictures of objects, people, and action. Match concrete objects/pictures of objects by color/shape/size/use/function Recognize/identify outline pictures of objects/people Copy/draw lines/shapes after seeing models Arrange concrete objects to match picture Match pictures of objects with inner detail to concrete object/picture	

Visual Functions		Visual Tasks in Normal Developmental Milestones	
Visual memory for:			
Concrete objects, people, and color		Select specific inner details (single elements & actions) in picture	
Pictures of people, shapes, and objects		Select and categorize object/picture by size, color, and use	
Internal detail		Imitate position of objects in picture	
Abstract figures and symbols		Identify single elements in picture	
Spatial perception of:			
Single objects in space	**Sec. E. 3-5 years**	*Optical, Perceptual, and Visual Perceptual Functions:*	
Relationship of objects to self/ other objects		Remember detail of complex pictures and patterns	
Distance of objects/ people		Relate single parts to whole. Discriminate figure from background in near-distant perspective	
Body position		Identify object picture from partially visible element(s)	
Visual-motor coordination:		Assemble picture puzzles of shapes, objects, scenes	
Reach, grasp, manipulate, and place objects		Match single object picture to specific element in complex picture	
Imitate body position, movement, and action		Categorize object/people/action pictures	
		Identify action in pictures and tell story	

other buildings has shadows and a mixture of natural and artificial light to facilitate the use of optical and perceptual functions.

Moving through space with changing light and shadows while looking at objects and pictures requires visual concentration. Playing with toys and performing self-care tasks under realistic conditions foster refinement of both optical and perceptual functions.

These diversified environmental experiences encourage looking and

Complex object manipulation
Copy reproduce lines, shapes, and symbols

Visual/Perceptual
Figure-ground differentiation
Visual closure
Whole/part, part/whole relationships

Sec. F. 4-5 years

Optical, Perceptual, and Visual Perceptual Functions: Discriminate, identify, and reproduce abstract figures and symbols.
Select complex abstract figure by single detail
Trace, copy, and draw figures with straight and curved lines
Sequentially order figures by size or length
Select like symbols
Select letters in patterned background
Sort like figures by single detail

Sec. G. 5-6 years

Optical, Perceptual, and Visual Perceptual Functions: Discriminate, identify, and perceive relationships in pictures, abstract figures, and symbols.
Identify missing detail in pictures
Select similar figures
Copy symbols in different styles
Match word to word
Recognize/identify likenesses and differences in letters/words

Sec. H. 6-7 years

Visual Perceptual Functions: Identify, perceive and reproduce symbols singly and in combination.
Perceive constancy of letter/word styles
Identify single letters in several type styles
Reproduce abstract symbols from memory
Associate word with picture
Identify words on sight

facilitate progressive development of visual functions, forming the basis for enjoyment of looking and seeing as well as for performing purposeful and productive tasks required in community and educational settings. The quantity of visual information to be interpreted is increased and the tasks encountered require selection of distinctive visible cues for accurate performance. As the visual perceptual functions are refined, efficiency in visual functioning in all environments is enhanced.

Definition of Terms

The following definitions were developed from a variety of sources and written to convey the most accurate meaning and interpretation of the terms as they are used in the program.

Abstract Figure A pattern or configuration which has no specific name as a thing or object and in which lines are arranged so that segments may be perceived as complete figures apart from the whole.

Accommodation A process of adjustment of the eye for changing focus to see things clearly at different distances.

Concrete Objects Actual physical objects which can be experienced tactually and visually as known things.

Contrast The relative difference between the lightness and darkness of things observed.

Detail Particular elements considered separately and in relation to the whole.

Developmental Milestones Significant points in progressive improvement of the visual system for performance of physical and mental tasks.

Discrimination The ability to make distinctions within and/or between visual things.

Figure A collection of connected straight or curved lines representing a definite shape with inner detail.

Figure-ground The observed relationship between visible things and the background against which they are seen.

Figure-ground differentiation The ability to discriminate visible things apart from the background.

Fixation Aiming or directing the eye(s) to a specific spot or thing.

Focus The adjustment of the eye(s) to converge the rays of light so as to achieve the clearest possible image.

Identification The act of selecting and/or naming a particular thing.

Imitate To copy or mimic actions performed by another or represented in pictures.

Light reception A behavioral or pupillary response to light introduced at or near the eye.

Light reflection Light thrown back from a surface or object.

Looking The act of using the eyes to search for and examine visible things.

Manipulate To move, manage, and control with the hands while looking.

Optical Structures in the eye(s) which enable the control of light rays for seeing.

Optical functions Those skills related to control and use of the external/internal muscles and structures of the eye.

Outline Line(s) that mark only the outer limits of an object or figure and give shape to it.

Part-whole Seeing and perceiving the individual parts combined into an integrated whole.

Pattern A design of integrated parts perceived as a whole.

Picture A representation of real things or actions on paper.

Recognition Indication that what is seen is familiar or has been seen before.

Seeing The process of gathering and understanding information through looking.

Shape The solid form or silhouette of something.

Spatial Orientation Perceiving the relative position of self and/or visible things in relation to surrounding space.

Symbol A conventional or familiar sign that stands for or suggests something else when seen.

Tracking Following with the eyes and/or head the movement of a visible thing with body stationary or in movement.

Vision The process of looking, seeing, and perceiving through the sense of sight.

Visual association Perceiving a logical relationship between similar concrete, representational, and/or symbolic visible things.

Visual attention Sustained looking at visible objects or pictures.

Visual awareness Knowledge that something is present in the visual field.

Visual closure The ability to perceive a total picture when only a portion is visible.

Visual exploration Careful inspection of visible things or the surrounding environment.

Visual field The area of physical space visible when the body, head, and eyes are in a stationary position.

Visual function Physiological action of the visual system in responding to observed things.

Visual information Knowledge of the environment and the things in it acquired through the visual sense.

Visual memory The storage and recall from past experience of the observer's integrated visual information.

Visual motor The control and manipulation of body movements in relation to what is observed.

Visual perception At a point in time, the ability to understand, interpret meaningfully, and use information received through the visual sense.

Visual system All component parts of the eye, optic nerve, brain, and associational pathways which influence looking and seeing.

Whole-part Seeing and perceiving the whole as an assemblage of unique and individual parts.

ever be appropriate for all individuals, even those with common characteristics. However, a program designed to be used as a framework can be modified and adapted by individual instructors/clinicians to meet the needs of the learners with whom they work. The intent of the rationale presented for this program is to serve as a design with balance, consistency, and enough specificity to encourage flexibility and diversity. This approach helps make it possible to accommodate individual needs and desires for many of the real life tasks that low vision individuals are required to perform. ■

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II

Functional Use of Low Vision—Attitudes and Philosophies

The emphasis on use of low vision, especially in children and youths who have congenital impairments, has been accepted as a valid philosophy only in recent years. Even now, some agencies working with adults continue to base their programs on treatment of "legally blind" individuals as persons with no useful vision for personal or vocational purposes.

Earlier, some clinical, educational and rehabilitative personnel had tried to promote use of low vision, but "learning to see" was not considered a primary concern when severe impairments caused visual functioning to be slow and difficult. Many medical specialists have focused and still do focus on the structural and tissue damage to the eye rather than the characteristics of the total visual system and the capacity for learning to use the remaining vision (Colenbrander, 1977).

In schools, learning to read often was the single objective, and when it could not be achieved rapidly by using vision, the child was "put on braille" in a matter of a few weeks or months. Worse still, some teachers worried about too much visual reading or holding material very close or in strange positions in fear of "straining the eyes."[1] In rehabilitation settings, vocational tasks were of high priority. If the individual was unable to work visually with accuracy and precision, then teaching "blind techniques" to the person was assumed to be necessary.

A further deterrent to the promotion of the use of severely impaired vision has been a reliance on the medical-legal definition of blindness presented earlier. Legal blindness does not mean the person is unable to see. Some estimates suggest that more than 80% of all legally blind individuals have usable vision for functional purposes. The continued use of "blind" as a label for those who have usable vision confuses them, their families, and the general public.

Perhaps appreciation for the value of information acquired through the visual sense has not been understood clearly either. Acceptance of "legal blindness" based on measurement of central visual acuity at distance as an absolute and valid descriptor of those individuals with useful vision may have led to a degree of complacency. A further assumption that has no basis may have been made: namely, if a person has enough vision to be helpful, he will use it. This is not so. Untrue, too, was the idea that the use of vision, even when there was impairment, was spontaneous and automatic.

Now it is known that (a) the visual system is a complex network which functions in concert with and in relation to many other body systems and (b) that individu-

[1]Defined in a recent presentation as a "state of fatigue from using the eyes."

als with and without impairments learn to function visually through a process related to learning, interest and motivation, and attention to available visible features.

There may be tendency to view visual impairment resulting in low vision as a characteristic within the individual or a basic part of the personality. Individuals may be perceived as having a problem which influences behavioral interactions with others. They may be treated accordingly. Such an attitude or philosophy denies the human capacities for adapting, coping, and learning to use what one has. For example, eye contact with another person is a personally and socially reinforcing behavior to sighted individuals as well as those with low vision. Because many low vision persons have difficulty in maintaining eye contact, sighted persons may avoid looking at them, thereby treating them as different. Such behavior becomes entwined in a vicious circle in which adaptive behavior is not expected or encouraged and is thus never learned.

Some low vision persons resist "learning to see" for various reasons such as (a) failure to perform visual tasks, (b) inability to live up to visual expectations, (c) fear of becoming independent and possibly losing certain benefits, and (d) lack of desire to invest the extra time and effort required.

There are still many unanswered questions concerning use of low vision, but individual learning does not stand still and wait for all the answers. All persons working with individuals with low vision need to commit themselves to developing and accepting a positive philosophy about functional use of any degree of vision. Such an attitude will do much to promote greater efficiency in visual functioning.

Sources of Attitudes

Parental attitudes towards their low vision child may be influenced strongly by the words used in the medical diagnoses. When a doctor says a child (person) is blind (meaning "legally blind"), parents and others may take this to mean that there is no sight present. Parents may never learn what the medical-legal definition means unless they ask questions. If parents interpret "legally blind" to mean "no vision" they may communicate this literal meaning to family, friends, and the general public where attitudes about the child (person) may become ingrained.

Personnel in service agencies may fail to differentiate between individuals with considerable usable vision and those who are totally blind. Many in the medical profession seem to have the philosophy that "legal blindness" means no usable vision is present. Most agencies use the legal definition as one criterion for eligibility for service, and personnel may assume that all individuals referred have the same needs for service regardless of the degree of vision. Therefore, all persons are seen as "blind" and taught how to be blind (Scott, 1969; Wolf, 1971).

Attitudes of these two groups of specialists influence the public attitudes more

than any other sources. Parents who become aware that their children have some visual ability may reject much needed counseling services for their children because they perceive a stigma attached to the word blind or to schools or agencies for "the blind." They do not realize that there are many services available for those with usable vision.

On the other hand, many youths and adults fail to seek assistance because they consider themselves sighted rather than blind.

This dilemma is not likely to be resolved until personnel from all disciplines begin to realize just how much attitudes are influenced by terminology. More importantly, all persons need to use words to describe and think about individuals with usable vision which are different from those words used in relation to persons who are totally blind (Colenbrander, 1977).

Variations in Functional Terms

Very low vision in the early years of life gives little indication of future capacity for visual functioning because of underdeveloped sensitivity in the macular area of the eye and the optic nerve. Youths and adults, previously blind, who have vision restored are unable to interpret visual information until images can be stored in the visual cortex of the brain. Several months or years may be required for them to integrate the strange visual images with other perceptual information in order to function efficiently on the basis of what is seen (Valvo, 1971).

Functional vision is learned by doing—moving and interacting with objects in the environment as they are seen (Harmon, 1965). There is no way to get an accurate measurement of functional acuity so the clinician must accept and utilize information observed and reported by a teacher, mobility instructor, parents, or others (Faye, 1976).

Numerous functional definitions concerning vision have been suggested. Some focus on vocational factors such as eye-to-hand coordination in visual-manual tasks requiring precision in manipulation and use of tools. Others stress distance vision in indoor and outdoor environments where viewing under differing lighting conditions is required for movement and interaction. Still other definitions are concerned with the ability to function educationally in such near vision tasks as reading, writing, and so on. (Apple & May, 1971; OSTI, 1971).

Such functional definitions may limit the nature and scope of information available on the overall visual potential of an individual. Some may focus almost exclusively on a small segment of functioning for specific purposes. Low vision persons may develop unrealistic attitudes about themselves and their functional vision by either overestimating or underestimating their visual ability to perform other functions. Attitudinal confusion may even be present during assessment for possible prescription of optical aids. Individuals may not understand that optical aids can merely improve blurred or distorted visual images. Neither do they

understand that magnification and optical aids may improve function for one specific purpose, but not for another and that visual functioning may vary greatly from day to day.[2]

Thus low vision individuals and those working with them need to realize that (a) the ability to function visually is not necessarily determined by measured visual acuity, (b) functioning visually for one purpose may not assure performance of another visual task, and (c) clarity of visual information is not available at all times.

Parental Attitudes

In the developing infant and child, attitudes of the parents toward that child are transmitted by actions or lack of actions as well as by what is said or not said. The basis for self-image is established in the early years. Parental feelings of fear, anxiety, guilt, hurt, and/or pity may have an effect on the child long before the impact can be noticed. Attitudes of parents also help determine the child's self-expectations and achievement goals. (Halliday, 1971).

Low vision children may be a real puzzle to parents. One minute they seem to use vision, and the next moment appear not to see at all. Parental attitudes about their children may need to be tentative and flexible for several years because no one can give accurate and definitive answers about future visual ability.[3]

Teacher Attitudes

If a teacher accepts that the idea individuals can "learn to see" and can make improvement in visual functioning, it is likely that this attitude will be conveyed in enthusiasm and encouragement to the learner. When a teacher really believes in the importance of using low vision in all activities, the teacher may put greater emphasis on looking and make more time available for functioning visually.

On the other hand, when there is uncertainty, doubt, or over-concern for the time involved in permitting learners to use residual vision, this attitude may create the need for undesirable adaptive behaviors in students. They may quit trying to see or pretend to see things that they cannot see. Some may even become resistant to classroom work or feel themselves to be a "burden," and just keep quiet, but learn very little.

Even though reading and other academic subjects have high priority in school, teachers need to promote the use of vision outside the classroom—in the halls, lunchroom, playground, and so on.

When teachers understand that use of low vision can only be helpful, and can never be harmful, many doubts and anxieties cease. Some teachers become more concerned with speed of learning than with steady progress. They decide that a

[2]See Chapter V.
[3]See Chapter VII.

learner would move faster by using "blind methods" rather than through use of residual vision. If time were the only matter of concern, this decision would be true, but such an attitude gives no consideration to the overall quality of the learning nor the needs of the low vision learner for functioning in other settings throughout life.

Attitudes of teachers are a strong factor in determining how other learners, teachers, administrators, and parents perceive the low vision child. Whether or not adaptations are made within the educational setting and whether or not peers accept and include children with visual impairments in their work and play is largely determined by the attitudes and efforts of the classroom teacher.

Without a very positive attitude and a strong philosophy that considers the use of low vision important, teachers may not be willing to plan, organize, and follow through with the work necessary for the low vision child to learn to see. Some teachers feel insecure in teaching a learner of any age to use poor vision more efficiently. However, once their low vision learners show progress, these teachers tend to become enthusiastic.

A few teachers fail to keep in mind the fact that all visual tasks are performed by low vision learners at the in-between level of seeing. Some things are seen and others are not, even though they may be larger or closer to the person. Acceptance of all the variations in visual functioning is a part of working with low vision learners.[4]

Developing Positive Attitudes

The following ideas and suggestions may be helpful to parents, houseparents and/or teachers in development of positive attitudes toward low vision individuals and in adopting a philosophy that enhances their working relationship with these persons.

- Personal acceptance of the learner with his or her the visual impairment is a necessary part of a healthy attitude of anyone who is trying to foster increased use of vision in functioning.
- An attitude of realistic hope about "learning to see" needs to be maintained. Parents and teachers should neither expect nor press for definitive answers from clinical specialists about "how much vision" the individual has.
- Parents and teachers, because they are with low vision children much of the time, know more about how much and what they see than can medical and clinical persons who spend 15-30 minutes with them in diagnostic settings.
- To refer to children with light perception as blind is to give them an inaccurate image of themselves. Light perception can have meaning and be used for learning to move more efficiently. If parents and teachers think of the low

[4]See Chapters IV and V.

vision child as one who sees, the child will think of him or herself in the same way.

- The concept of "development of ability to see" may be difficult for the learner to understand. Individuals have to look before they see. Development comes about only through an interactive process of sensory intake, behavioral responses, and repetition of actions until memories are stored in the muscles and brain.
- Vision can never be "saved" or "used up," but the more it is used, the greater the chance of improved visual functioning. There is no way that use of vision can in any way harm the eyes or cause vision to become worse.
- Capacity for visual functioning rather than chronological age should be considered paramount. Learning to see may extend from birth through adulthood.
- The power to function visually is unique to individuals and must be measured or assessed functionally rather than as a trait or characteristic.
- Acuity measurements have little relation to how the learner may be able to function in the classroom. Vision in only one eye or very low acuity measurements does not indicate a specific percentage loss in visual functioning.
- Corrective lenses and glasses seldom give low vision persons normal vision—just better vision than without them.[5]
- In the beginning, regardless of age, learning to see and to use vision effectively will be slow and awkward. There is no way to rush the process. Thus teachers need to exercise patience and permit learners to move deliberately through the performance of each visual task.
- Visual learning is exciting and liberating to the learner and is a strong motivator for progress.
- The child with low vision has learning needs common to all children. Technical needs (devices, materials) simply make functioning as a learner a little easier.
- A visually impaired learner, especially one with low vision, does require some adaptation of materials and methods and individualization of program.[6]
- Large print is not the only solution to learning or reading problems.[7]
- Being able to read visually does not mean that the person is visually efficient in performance of all tasks or in functioning visually in all environments.
- Learners with impaired vision need to be encouraged to use vision in every task and activity. Low expectations result in lack of progress.
- Parents and teachers should avoid making excuses for the learner because of poor vision. They must resist any temptation to expect less of the low vision learner than is expected of other students.

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[5]See Chapter V.
[6]See Chapters V, VI, VII.
[7]See Chapter V.

- Ordinary accomplishments need not be considered extra-ordinary. Performance of any tasks normally done by peers should be accepted as routine.

Questions Still To Be Answered

There are still many unanswered questions about low vision and its impact on the functioning of both young and older learners. No definitive answers to the following questions have been resolved through research to date, but being aware of the questions may have an influence on the philosophies adopted by those closest to the individuals with visual impairments (Barraga, 1976).

1. How much vision is enough vision for particular functions?

2. What factors identify a handicap in visual learning?

3. What variables are critical in influencing the performance of visual functions in individuals of all ages?

4. Why is it that some persons with severe visual impairments function at markedly higher levels than others who have less serious impairments?

5. Is it the visual impairment itself or other individual characteristics that inhibit or limit visual learning and functioning, especially in children?

6. Is there an established relationship between the nature and severity of the visual impairment and the capacity for efficiency in functioning of an individual?

Although these are very important questions, no attempt has been made to give specific answers to them. However, many of the suggestions made relate directly to the questions posed. Readers may make their own inferences and accept or reject the ideas for inclusion in a personal philosophy. Research has established a basis for some important conclusions:

1. A child with impaired vision sees what he or she sees, thinks everyone else sees what he or she does, and does not know what he or she *should* see, much less what he or she does *not* see (Marshall, 1974).

2. The younger the individual the greater the likelihood of rapid progress in learning to use vision efficiently, all other factors being equal (Hull & McCarthy, 1973; Wilson, McVeigh, McMahon, Bauer, & Richardson, 1976).

3. No two individuals with the same type of eye defect or condition will function visually the same way. Therefore, factors other than vision may have greater effect on functioning. Visual functioning may vary from day to day and from situation to situation within the same individual (Faye, 1970).

4. Visual acuity measurements (distance) have little or no relation to how well a person may be able to use vision for learning at near point (Faye 1970).

5. Although no relationship exists between visual perceptual ability and dis-

tance visual acuity, a slight but not significant relationship is shown with near visual acuity (Carroll & Hibbert, 1973).

6. Ability to recognize letters at a given distance bears little relation to use of vision in practical life situations since there is no precise measurement for functional acuity (Faye, 1976).

7. There is no relationship between measured acuity at any distance and efficiency in reading among children with visual impairments (Bateman & Wetherall, 1967).

8. No relationship has been found between reading achievement or grade placement and the kind or degree of visual defect (Bateman, 1964; McLaughlin, 1974).

9. There is no relationship between measured acuity at any distance and the size of type impaired children can or prefer to use. Furthermore, the preferred type size is not necessarily the most readable (Sykes, 1971; 1972).

10. No difference has been found between reading speed in large type without magnification and regular type *with* magnification. Many children have not been taught to use magnification (Bock, 1971).

11. All visually impaired children experience such visual perceptual problems as lack of stable visual memory and organization, spatial relations, and depth perception (Barraga, 1964).

12. Children with serious visual impairments have a limited repertoire of basic understandings of the environment and of words requiring visual interpretation (Barraga, 1976).

13. The visual efficiency of all low vision persons can be increased through a planned program of stimulation and learning experiences (Ashcroft, Halliday, & Barraga, 1965; Holmes, 1967; Hull & McCarthy, 1973; O'Brien, 1976; Wilson, et al., 1976).

III

Major Eye Conditions and Their Influence on Visual Functioning

Impairment of the eyes or other parts of the visual system may occur at any time in a person's life. Conditions often of unknown origin that are present at birth are called developmental anomalies or congenital conditions. Hereditary conditions exist at birth even though their effects may not appear until later in life. Accidents often cause other acquired visual impairments.

An in-depth discussion of every disease or condition affecting vision is beyond the scope of this book. Only those which are most common in children and youths and which severely impair without generally destroying vision will be identified. Muscle imbalances and neurological disorders not specifically related to impairment in the visual system and less damaging conditions which are amenable to correction with regular prescriptive lenses will be omitted. The primary focus will be the effect of the impairment on the individual in terms of the functional use of vision for exploration, learning, and performance of visual tasks.

To teachers, parents, and others who live and work with low vision individuals, the continuous development of greater and greater efficiency in performance of visual tasks is more significant than the actual impairments or diseases. However, some knowledge of conditions of the eye and the visual system helps to understand how visual functioning is influenced and what to expect of individuals.

The conditions to be discussed are grouped into three general categories according to the predominance of occurrence: (a) congenital developmental anomalies, many of which have unknown causes; (b) hereditary conditions; and (c) diseases, infections, injuries, etc. Some conditions may appear in more than one of these groupings, but the time of onset and the cause may be quite different.

Congenital Developmental Anomalies

Cataracts Any time there is a cloudiness within the crystalline lens tissue, a cataract is present or beginning to form. Some are present at birth and indicate that there has been an invasion of the embryonic lens by infection or poison such as the German measles virus causing the lens to become cloudy. Other cataracts present at birth may be hereditary. Sometimes cataracts form as a consequence of other conditions. Cataracts interfere with passage of light through the eye, if present in the central lens, resulting in stimulation of fewer retinal cells in the area of sharpest vision. In infants and babies, cataracts restrict development of the use of the optical mechanism unless objects are brought very close to enable the child to fixate and develop muscular control. Central cataracts obstruct foveal vision: in reduced light, the pupil can expand and permit the individual to see around the

obstruction, but in bright light, the pupil constricts, and vision is reduced markedly (Faye, 1976).

Surgery or aspiration (by suction) may or may not be possible. If indicated, the procedure should be accomplished early in life so as to permit maximum visual development. Contact lenses and/or bifocals may be well accepted by very young children after surgical removal of cataracts or even when cataracts cannot be removed early in life.

When cataracts are present or when the lens has been removed, vision is likely to fluctuate according to physical surroundings and natural or artificial illumination. The size and location of the cataract influences the reduction in sharpness and clarity of detail and color. However, form and movement are perceived rather well, and gross movement is rarely restricted. The individual may turn the head to see around the cataract and thus appear not to be looking directly at something. Magnification of objects and materials frequently will help to improve visual perception as will control of light intensity in surrounding areas. Children with cataracts need light on material from *behind them*; they will function least well when facing a light source. If they are writing, the light may come from above and slightly to the side to prevent a shadow on the work from the head. Lights with adjustable arms are highly desirable for such work. Too much light or any glare or reflection will interefere with maximum visibility when cataracts are present (Harley & Lawrence, 1977).

Dislocation of Lens There are numerous causes of dislocated lenses, some of which are (a) congenital developmental anomaly, (b) genetic factors, (c) blows to the eye(s), and (d) diseases. The position of the lens may be tilted up or down, or it may even be completely detached from the capsule.

The major refractive and accommodative mechanisms will not function when a lens is dislocated. A convex lens will probably be necessary for reading and an aphakic correction for distance. Rapid accommodation to changes in distance viewing is impossible and time will be needed for the individual to get an object in focus. Unusual positioning of the head and body in order to achieve or maintain focus is to be expected.

It is difficult to prescribe and fit lenses for any child who is unable to cooperate in the process or cannot respond to the charts or targets used. Teachers and parents need to understand that in such cases, (especially in cataracts and dislocations), the lens power of glasses has been determined by optical measurements of the eye and may not be as precise a correction as can be achieved when the child is older and can cooperate in determining the lens which gives the greatest sharpness and clarity for him or her.

Glaucoma This condition is one of improper circulation of fluids causing an accumulation of fluid between the lens and the cornea which increases the tension

in the eye. Intense pain is likely to accompany this rise in tension, and the eye becomes extremely sensitive to light and any external pressure.

Glaucoma may be congenital and is generally related to other structural anomalies. In some cases, one or both eyes may be quite large (*buphthalmos*) indicating the need for immediate relief of the pressure to prevent permanent structural damage. If some vision is retained following surgical procedures to relieve or correct the abnormality, the person may still have poor peripheral and night vision, but sufficient central vision for close work. Usually, good quality illumination with minimum glare is required for efficient functioning. Medication (drops in the eye) may help to relieve some of the pain as well as permit better vision, but efficient use of vision is likely to fluctuate in relation to the effectiveness of the medicine in relieving pressure.

Other Congenital Anomalies Many of the following are reported from time to time, but occur so infrequently as to require only brief comments. A *coloboma* may be present because part of the structure of the eye is lacking as a result of faulty embryonic development causing a lack of closure of cells in the retina, choroid, iris, and/or ciliary body. Vision may not be affected seriously unless there is a cleft extending into the choroid, retina, or optic nerve. The farther back into the eye the cleft extends, the greater the chance of serious loss of visual functioning. The location of the coloboma in the retina helps to determine the effect on central or peripheral vision; for most, magnification is quite helpful.

A congenital anomaly about which little can be done is *microphthalmus*, an abnormally small eyeball. The internal structures are reduced in size causing vision to be greatly affected.

Orbital displacements may accompany head and facial deformities, and may result in misalignment of the two eyes. When this occurs, binocular vision is impossible, although vision in one or both eyes may be normal, in which case the eyes are used alternately but never together. Speed and efficiency in visual functioning may be slow in developing especially in very young children.

Hereditary Conditions

Research in genetics has enabled scientists to identify many conditions whose causes are now linked to hereditary factors. Only the more prevalent ones will be discussed here.

Achromatopsia The more common name of congenital cone blindness identifies this hereditary condition. The absence of cones in the macula may be complete or incomplete, and is accompanied frequently by photophobia and nystagmus. Avoidance of light and glare, and use of tinted lenses may improve performance of visual tasks. Visual functioning may improve with maturation and perceptual development.

All of the conditions which affect the choroid and retinal areas cause serious problems in visual functioning. This portion of the eye contains the receptor cells for light. When the problem is in the macula area, visual development is slow and acuity is affected from birth. The visual impulses from the peripheral cells may be so weak that coordination of movement with vision is difficult and discrimination of detail is virtually impossible. Attention to any correction possible and to intensive visual stimulation is imperative to prevent delay in development of the entire visual system and its functions.

Albinism This condition has long been known to be hereditary. There may be a lack of pigment in the eyes and sometimes in the hair and/or skin as well. With no color in the iris, the light passes through and is reflected back with a reddish glow from the blood vessels in the choroid, giving a pink appearance to the eye, and resulting in extreme photophobia.

The individual with albinism usually has high refractive errors, reduced visual acuity, and great sensitivity to light causing squinting and bizarre facial expressions. Accompanying nystagmus is not unusual, and some extremely close work may be difficult and tiring. Albinism generally interferes very little with normal activity. Albinos need only to move closer to distant objects or hold print slightly closer to see clearly so long as the illumination is controlled. Most respond well to magnification of any type, and many are also good candidates for contact lenses. A few may need bifocals and some may need tinted lenses to reduce glare (Siegel, 1976).

Since albinos are unable to control the quantity of light entering the eye, most function better in average or reduced lumination. Intensity of light near the face, and glare from the windows or chalkboard may limit visual efficiency markedly. Tinted lenses or eye shades are often quite helpful. Almost all albinos are able to function satisfactorily with standard print materials.

Aniridia This genetic condition in which the iris is incomplete or totally absent may result in the whole front portion of the eye being very small and underdeveloped. There is no coloring in the eye because of the absence of iris tissue, and this eliminates the possibility of automatic reduction in pupil size to control the quantity of light entering the eye. Without this ability, there is no way to sharpen the depth of focus naturally. The visual functioning will very probably remain quite limited.

Other ocular defects such as cataracts and glaucoma may be present as secondary conditions to the aniridia. Vision will probably be better at night and under less intense lighting conditions. Magnification may be quite helpful at times, but functioning is likely to vary from day to day.

Choroideremia This genetic defect causes breaks in or absence of choroid and retinal tissue. The condition may be limited to a slight break in tissue closure which interferes with vision only in the areas of the cleft. On the other hand, the

absence of tissue may spread over a larger portion of the visual field and severely limit the performance of visual tasks. Magnification is of value to some who have strong motivation to see, but the effort is likely to be demanding and the process a very slow one.

Corneal Abnormalities Some corneal irregularities may be minor and corrected with refractive or corneal lenses. Marked irregularities in the shape of the cornea (keratoconus) may require surgical replacement of the cornea, a process dependent on the availability of suitable donor corneas. Even with surgery, restoration or provision of clear vision is variable and dependent on many factors. When there has been little or no vision previous to refraction or surgery, a period of slow optical and visual perceptual development is to be expected. Sometimes, the opacities may interfere with efficiency in some activities, but have little effect on others.

Optic Nerve Atrophy Atrophy in any portion of the optic nerve impedes the transmission of visual sensations even when other parts of the eye are functioning properly. Some atrophies may have a genetic base and may be present at birth or become manifest later in life. The degeneration of the nerve fibers is irreversible. Decrease in or absense of color vision and decreased acuity are obvious symptoms. Magnification is often helpful, and usually a high level of illumination is beneficial. Continued atrophy of nerves may result in greater and greater reduction in visual functioning.

Pathological Myopia Severe progressive myopia is a hereditary condition which may be manifest in early youth or later in life. The retina stretches and thins as the eye continues to lengthen from front to back. In less severe cases, contact lenses may be very good; or hand-held magnifiers and/or telescopes may be used to supplement regular lenses. Generally, when glasses are worn on the face, the lenses are plastic ones because of the thickness and weight. Distance vision may become increasingly poor, and young children may not be aware of this unless checked frequently. High levels of illumination may be required for sharpness and clarity.

Retinal Degeneration Some general retinal degeneration has been determined quite recently to be of genetic origin. The deterioration of cells may center in the fovea-macula area interfering with central vision and making it easier for the person to function when illumination is reduced. In other instances, the degeneration clusters in one or more areas of the peripheral retina causing a reduced field of vision and poor night vision similar to that caused by retinitis pigmentosa (discussed below).

Retinal impairments tend to make discrimination of very fine details and colors difficult unless things are very close and the lighting is adjusted to be compatible with the area of the retina which is healthy. Use of a telescope for distance may be helpful, and hand magnifiers and several types of optical aids may enhance close

work. Lighting is especially important, and glare will usually be a troublesome factor. Some individuals perform visual tasks with high intensity lights directed on the work; others prefer reduced illumination; a few like magnification with built-in lighting.

Retinitis Pigmentosa This hereditary condition may not become manifest before adolescence or early adulthood. There is a progressive degeneration of the peripheral retina, causing the visual field to become more and more restricted resulting in night blindness and blurred vision. The loss of vision may be slow or rapid depending on a variety of individual factors. The visual behavior of the person may resemble closely that of someone who has a general retinal deterioration.

Reading vision may remain intact for a long time, and high levels of illumination will be necessary for performance of visual tasks. Closed circuit television systems may enhance reading when central vision is good, and a pocketscope with infrared rays may help vision at night. The benefits of any type of magnification are variable, and are not likely to be of any help when the field is restricted to 5° or less.

Retinoblastoma This genetic condition is manifest by a malignant tumor in the orbit of one or both eyes appearing in infancy or very early childhood. If not discovered immediately, enucleation (removal of eyeball) may be necessary. In some cases, when detection is quite early, irradiation and chemotherapy may permit retention of the eye as well as some usable vision.

Diseases, Infections, and Injuries

Any type of blood or circulatory infection such as anemia, leukemia, or diabetes may cause hemmorrhaging of blood vessels in the choroid. When this occurs, there is swelling, and the vessels burst causing vascular damage and cloudiness in the eye fluids. In the case of diabetes, there may be recurrent hemorrhaging which, in time, could cause irreversible damage to the retina along with loss of visual efficiency. In fact, diabetic retinopathy is one of the leading causes of severe visual loss among the visually handicapped population.

Choroiditis This condition is indicative of inflammation in the choroid caused by a disease or infection. When the infection spreads to the layers of tissue behind the cornea, the condition is known as interstitial keratitis. This infection is sometimes the result of syphilis. If the infection is not treated properly, it may invade the corneal tissue itself and impair or even destroy vision. Choroiditis may be precipated by other types of infections causing temporary or permanent fluctuations in visual functioning.

Conjunctivitis This is a rather common infection of the eyes which causes an inflammation of the membrane lining of the eye and eyelids. If the condition is

chronic or is not treated properly, infecting germs may invade corneal tissue and leave scars even after healing. In such cases there is marked alteration in refractive ability which may be minimized with regular glasses or contact lenses.

Detached Retina One of the more frequent injuries to the eye is that of a detached retina often caused by sudden traumas such as blows to the head or face, excessive diving, or because of other conditions which result in stretching and thinning of retinal tissue, such as pathological myopia. The retina comes loose from the choroid, fluid collects behind it, and blood from the choroid cannot reach nerve endings in the retina to nourish them. If possible the loose portion should be reattached. Even when treated, there may be scars where the tear or detachment occurred. Individuals need high illumination with flexible lamps and metal reflectors. Magnification is usually quite helpful.

Histoplasmosis This condition is the result of a fungus usually acquired from birds and animals, and if not treated immediately can cause visual impairment. The fungus can invade corneal tissue and destroy it or leave permanent scars. The prevalence of the condition is related to areas or regions in which cleanliness standards are very lax.

Neuritis Inflammation of the optic nerve is indicative of this condition, which needs to be treated immediately to prevent degeneration of nerve fibers. The inflammation may be associated with such systemic conditions as malnutrition, anemia, diabetes, poisons, and drugs. Effects are the same as those discussed under optic nerve atrophy. Early diagnosis and treatment may be effective in preventing loss in visual functioning.

Nystagmus Although a symptom of neurological disorder rather than a primary condition in itself, nystagmus is quite noticeable to many observers. There is difficulty in holding the eyes steady, and slight or marked quivering is evident. Usually nystagmus is a secondary symptom accompanying a number of conditions in the visual system. The unsteadiness in fixation and movement of the eyes has little effect on visual functioning, and generally, is of greater concern to observers than to the persons themselves. When the symptom is severe the neurological disorder may interfere with visual perceptual tasks.

Peripheral Field Defects There are numerous types of defects in the field of vision, and they are caused by a variety of degenerative conditions and/or by strokes, accidents or other insults to the brain. Serious head injuries or objects penetrating the brain may destory portions of the optic nerve between the eye(s) and the reception area in the brain. The result may be depression of vision in a small area, a quadrant (¼ of peripheral field), or in an entire half of the field (hemianopia) of either or both eyes. All of these conditions have important implications related to safety (loss of scanning ability); orientation (spatial obscurities); the need for head and body adjustments in order to focus on objects; and the possible need for training in eccentric fixation (Faye, 1976).

Retrolental Fibroplasia (RLF) A major cause of visual impairment in the 1940s and 1950s, RLF is usually caused by administration of excessive oxygen to premature infants. The condition was under control for a number of years. However, increases in premature births and other undetermined factors related to brain injury, drugs, etc. have resulted in a marked reoccurrence in RLF in recent years.

The oxygen seems to cause an overgrowth of immature blood vessels. The mass outgrows the capacity to nourish itself and fibrous mass or scar tissue develops in the retinal area (Harley & Lawrence, 1977). The extent of damage may be highly variable, but most RLF's tend to be myopic if they retain any vision at all. For those who do have useful vision, simple hand magnifiers may be helpful for close work, and telescopic devices may be valuable in distance viewing. A few RLF's may be able to wear spectacles and attach a plus sphere for reading. Intense light is usually beneficial and closed circuit television systems are used successfully by some individuals[8].

[8]See Chapter V.

IV

Illumination and Visibility Factors

Reference has been made in earlier chapters to lighting and to visibility characteristics as important considerations for low vision learners. Indeed, all persons can realize visual capabilities to the fullest extent only when seeing conditions are optimized.

Terms such as light, lighting, illumination, visibility, and seeing are used frequently, but may not have the same meaning for everyone. Guth (1971) explained them in this way. *Light* pertains to the quantity of illumination of the task. *Lighting* is an aspect of quality and refers to the brightness of the entire visual environment. *Visibility* is concerned with both light and lighting which combine to determine the degree or extent to which something can be seen with the eyes. *Seeing* is the final activity of the eyes and brain to perform visual tasks. The primary concern in illumination is to balance all of these factors in order to create the visual environment necessary for each task for every individual.

Concepts of Visibility

The process of seeing involves relationships between physical, psychological, and physiological functioning. The physical status of the eye of the person has to be considered along with his or her mental ability and those psychological factors which influence the complex eye-brain functions. In any individual, the physiological and psychological elements will be interacting simultaneously. The simplicity or complexity of the visual task is determined by (a) the extent and size of the details to be discriminated, (b) the distinctive features for differentiation, (c) contrast with the immediate background and the surroundings, (d) the quality of illumination, (e) whether the material is stationary or moving, and (f) how much time is available for seeing (Guth, 1971).

In addition, there are other factors which may modify visibility such as (a) a learners previous exposure to particular conditions which affect the visibility of objects depending on the time required for adaptation to light or darkness, (b) the individual's use of foveal and peripheral vision, (c) viewing distance and the quantity of light or glare in the surrounding area, (d) color contrasts between objects and their backgrounds, (e) the amount of supplementary information available through other senses, and (f) the presence or absence of noise and/or other environmental distractions.

Good quality of illumination always improves visibility, and hence, visual functioning. Visibility is not however, always improved by increasing the quantity of illumination. The more quickly information from the eyes can reach the brain, the more time an individual has to interpret and respond to it. When contrast is

low, more light is needed in most instances especially when the environment and/or the object is not familiar. Low vision learners may require as much as 3 to 10 times the illumination needed by those with no impairments just to make things visible even when they are familiar.

Visual Environment for Learning

Each person is more efficient and comfortable when the visual environment is individually designed. Such an ideal is not often possible. However, individual adaptations for low vision persons are desirable because the needs are unique to the eye conditions and the visual tasks being performed.[9] Generally, two basic principles are equally important to low vision learners.

Minimize Glare "Glare is any brightness condition that causes discomfort, annoyance, loss of visual performance, or eye fatigue" (Harley & Lawrence, 1977, p. 75). In almost all low vision learners, glare in any environment reduces visibility and interferes with accurate and efficient functioning. Light falling *directly* in the eyes from any source will generally create glare. In addition to reduction in accuracy of seeing and in performance of visual tasks, glare contributes to visual fatigue. The ideal situation is for light to be distributed on the visual task in equal amounts from all angles with none of it reflected back toward the face.

Maximize Contrast A general contrast ratio of 3:1 between the task and the immediate working area is considered acceptable. If the task centers on something black or dark in color, the lighting in the surrounding vicinity needs to be more intense. On the contrary, if the task involves something white or a light color, the immediate area should be darker in order to provide a desirable contrast visibility. For some low vision learners, a contrast ratio of as much as 10:1 may be preferred.

Under natural lighting conditions, especially outdoors in daytime, little control can be exercised over the degree of contrast in the environment. The low vision person may need to use darker lenses, shades, or other control measures to minimize reflections and glare.

Indoors, much more can be done to control contrast. Consideration should be given to color of walls and ceilings, floors or carpets, chalkboards, and furniture. The intensity and placement of artificial lighting needs to be controlled. Surroundings which are too light or too dark reduce the visibility considerably.

For performance of academic visual tasks—reading, writing, drawing, cutting, or pasting—the low vision learner needs sharp contrast. Black on white, or vice versa, provides maximum contrast; but if glare is present, the use of some colors is preferable so long as clarity can be maintained. For example, replacing a white background with buff or light yellow, and using an intense blue, green, or purple on the buff or light yellow will maintain legibility of printed or written materials.

[9]See Chapter III.

Artificial Lighting

Since lighting may be the most important nonoptical aid for low vision persons, attention should be directed to the quantity and quality of artificial light sources. The ideal artifical lighting conditions are those which provide an overall diffusion of light from all angles with additional intensity directed on the task when necessary.

Both incandescent and fluorescent light sources can be satisfactory if they are (a) appropriate intensity, (b) shaded or reflected properly, and (c) controlled or directed for individual learners. A general low level of about 30-50 footcandles of overall illumination in a classroom is recommended. There should be wall or floor outlets in addition, to permit the use of individual desk lights, high intensity light, or lighted magnifiers. Overall illumination of as much as 150-200 footcandles of light may cause many low vision learners to experience visual or retinal fatigue and may actually be a deterrent to efficiency in visual functioning (Faye, 1975). In final analysis, individual needs should be the overall criteria for lighting. Lighting should be of sufficient clarity to enable the learner to see materials and to perform the necessary visual tasks in the most comfortable visual environment.[10]

Here are some specific suggestions for lighting and the control of it.

- All areas surrounding the low vision learner need to have diffused illumination.
- In most instances, the best arrangement of lighting for maximum visibility without glare is achieved by placing the light source in front of a learner close to the task so that the shade directs the light only on the task.
- Higher levels of illumination are usually preferred by learners who have conditions such as optic atrophy, macular degeneration, and retinitis pigmentosa.
- Learners with such conditions as albinism, aniridia, some types of cataracts, and corneal opacities usually function more efficiently under minimum lighting conditions.[11]
- Intensity of illumination can be regulated by adjusting the distance from the light source or lowering the footcandle output of the source.
- Even under optimal lighting conditions, glare may occur. It may be reduced by use of shielding devices worn by the learner, by adjusting the diffusion and directional source in relation to the visual task. Some teachers suggest using yellow filters over the work.
- When talking, instructors need to position themselves so that learners are not looking toward windows or other light sources.
- Both hand-held and stand magnifiers with and without built-in light sources, should be available as choices for low vision learners.[12]

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[10]Information from the Low Vision Observation Checklist should be helpful.
[11]See Chapter III.
[12]See Chapter V.

- Lighting needs of low vision learners are highly individualized, and all possible options need to be explored before lighting sources or arrangements are finalized.
- The vision consultant (specialist) should evaluate the classroom lighting and make suggestions for improvement.

The sharpness and clarity of vision as well as the comfort and efficiency of functioning of low vision learners is highly dependent upon the visibility and illumination factors discussed here. Schools and agencies need to give careful attention to artificial lighting in addition to well planned use of natural lighting sources in the design or modification of buildings. The assumption that more is better or "the greater the quantity, the better the quality" is false as far as lighting and the low vision learner is concerned. In any case, low vision learners themselves need to be consulted regarding the adequacy and effectiveness of the lighting.

V

Magnification, Low Vision Aids, Type Sizes, Faces, and Styles

Efficient visual functioning as it relates to use of other senses, perceptual-cognitive development, and psychological attitudes is learned as a part of day-to-day use. Magnification, optical aids, or large type alone may make a person see more clearly, but none of these provide automatic visual efficiency. Because of this, visual stimulation and performance of a variety of visual tasks is desirable *before* or simultaneously with referral for low vision evaluation or use of visual aids.[13]

Holmes and Taylor (Holmes, 1967; Taylor, 1978) have found that learners who have received a series of lessons in visually stimulating activities prior to use of magnification or aids are able to make more effective use of various aids. An optical aid can be of little use if one does not know what to look for, when to look for it, what the object is supposed to look like, and how to identify what is seen.

The best possible correction with regular lenses is of critical importance. Some *very* low vision learners may need additional aids to foster looking. In any case, there must be some stability and constancy in visual functioning before an aid can help.

Young children have virtually unlimited accommodation, allowing them to bring material to within 2 or 3 inches of the eye while learning to see (Faye, 1976). As long as they are able to do this, there is little need for optical aids for near viewing, although lenses may be of value for distance.

If vision can be improved dramatically at near and/or distance by use of magnification or optical aids, the difference in clarity and sharpness could change disinterest into curiosity and shyness into confidence (Skydsgaard, 1976). Carpenter (1976-77) says that successful prescription of low vision optical aids can mean a change in self-image for some learners from

blind to sighted,
braille to print,
listener to reader,
dependence to independence.

Through the use of visual aids many learners experience a feeling of success for the first time. Success, to them, means improved performance in some task previously found to be too difficult or impossible.

This holds true, too, for the student who has some visual ability, but is primarily

[13]Much of the material on low vision aids was prepared by Mrs. Ruth Holmes, a teacher at the Illinois School for the Visually Impaired, Jacksonville, and also a consultant to this project.

a tactual learner. He or she should be encouraged to use vision in every possible way in the learning-living process. Most "daily living" tasks can be performed more easily and with greater precision by use of any bit of vision.

There are no definitive rules upon which to base decisions vis-à-vis a choice of optical aids or type sizes. Choices must be made to fit individual needs. There are several ways to enlarge materials and numerous aids are available for magnifying the observed image. Selection of the most appropriate aid(s) for specific individuals is related to the purposes for which the aid(s) will be used.

Print Legibility for Reading

The first consideration for reading legibility is the visibility of features of letters that give them individuality. Printed materials and prepared graphics have many characteristics that affect their readability such as:

The Legibility of Design of a Type Face The basic requirement for a type face suitable for use in a running text such as a book, magazine, or newspaper is readability. Individual letters should not be as thin as to be virtually invisible nor so fat and black as to become mere blobs on the page. Each letter must be distinctive in character and readily distinguishable from its fellows. Yet they must all fit together so well that any combination of letters becomes a harmonious whole. No letter, because of some idiosyncracy of design, should stand out among the others. Elaborate, ornate, or unconventional alphabets should be avoided.

Whether the Type Has Serifs or Is Sans-serif Serifs have been described as "little feet the letters stand on." They are the little protrusions to be seen at the tops and bottoms of letters. This book is set in a serif type face. They are one of the characteristics of so-called traditional type faces and they do seem to add stability to a line of type. Serif type faces have proven their readability over 400 years of use. Since their appearance is quite different from that of the printscript used in the primary grades, it is suggested that materials printed in these faces be used only with older children and adults.

As the name implies, sans-serif type faces do not have serifs. In general, every part of every letter is the same thickness throughout. These alphabets are quite versatile since they come in a variety of 'weights' from quite light to very bold and black. Because of their resemblance to the printscript of the primary grades, sans-serif types are very familiar to younger readers. Long texts, set in sans-serif types, may present difficulties for older readers since they are not quite as readable as serif types. The headings in this book are set in sans-serif type.

Use of Capitals Except for occasional brief passages, or in newspaper and advertising headlines, and in inscriptions, text matter is not generally set in capitals. The reason is plain; lines of capital letters are difficult to read. However, single words, as on flash cards, are quite acceptable.

The Boldness of the Type Boldness of a type refers to the width (in proportion to the height) of the lines that make up the letters. In typesetting this is called the *weight*. While some degree of weight in a type face may increase visibility, too much will destroy it. When a type face is extremely bold the spaces inside the letters, which help to identify them, are encroached upon, sometimes to the point where such spaces are virtually obliterated. Such types are to be avoided.

The Density of the Type Many types, particularly the sans-serifs, are available in a variety of configurations. In addition to letters of the customary proportions, some faces provide both condensed and extended versions. In condensed types the letters are extremely narrow in proportion to their height. Extended letters are quite broad in relation to their height. Of the two, extended types are easier to read but both are departures from the norm and should have no place in materials used with low vision readers.

The Sizes of Type Type sizes are designated in points. This is a purely arbitrary measurement and has little to do with the actual size of the printed letters except insofar as it can be assumed that 24 point type is larger than 12 point type. Point size refers only to the height of the letters, not their width. Originally the point (72 to the inch) referred to the height of the metal body on which the type letter was mounted. Now, particularly with the advent of photographic typesetting, point sizes are no more than a rough guide to the comparative sizes of different types. Among the many hundred of type designs there is considerable variation in designs of the same nominal point size. For example, 12 point types of different designs may range from less than 1/8″ in height to 3/16″ in height, a difference of over 50%. Below are some samples of Times Roman type set in different sizes.

Times Roman 24 point

Times Roman 18 point

Times Roman 14 point

Times Roman 12 point

Times Roman 10 point

Times Roman 8 point

Times Roman 6 point

Leading and Spacing Leading refers to the extra space set between lines of type. As a rule, leading improves readability when used judiciously. A certain amount of white space between lines is more comfortable; too much and the text falls apart and eye movement from one line to the next becomes less easy and natural. The bigger the type the more leading will be needed.

Spacing is always used to separate words. Too much or too little spacing between words will have an adverse effect on readability. In the case of very large types, 36 point or more, spacing may be used between individual letters to improve appearance.

Line Length The ideal line length is any line which can be easily read in one sweep

of the eyes. Obviously, if a line of type is too long, it will be read in increments followed by a pause in which the reader reassembles the line in his mind in order to assimilate its meaning. The optimum length of line, which is rarely achieved, is stated by type designers to be one and one-half alphabets. That is, in any size of type, the ideal line would be the length taken up by 39 (26 plus 13) letters of that particular type face.

Color of Paper and Ink White paper and black ink provide maximum contrast and most visibility. In some cases ivory or off-white papers may, for long texts, be easier to read because of a reduction of glare. Colored inks and strongly colored papers are not desirable.

Opacity of the Paper In all cases, paper should be sufficiently opaque to prevent printed matter on the back side of a page from showing through. Such show-through interferes with legibility. Then, too, thinner papers are more difficult to handle and can be easily torn, particularly by an inexperienced reader.

Paper Finishes The type of finish on the paper used is a vital factor in readability. For long texts, such as books, the so-called book papers are to be preferred. Their finish is smooth yet not so smooth as to suggest dullness to the reader. On the best of them there is no glare but the contrast with the type assures easy readability. Offset papers tend to absorb ink in such a fashion as to reduce contrast. Dull coat or matte finish stocks show type to good advantage and give life and brilliance to printed colors. Enamelled and coated stocks, while showing photographs to their best advantage, have a glare factor which discourages reading.

For low vision readers, one of the most important legibility concerns is the spatial arrangement of the print or graphic on the paper. The arrangement of lines on the paper is also important. The spacing of pictures or other representations in relation to each other affects the degree to which detail can be discriminated. Even the page size and the binding need to be considered and certainly the means of reproduction must assure high contrast between the printing or graphics and the paper.

The closer the letters in very condensed or bold type, the more difficult the material is to see. The combination of density and closeness gives a crowded appearance and makes the letters appear to run together. Shaw (1969) found that these factors did not make as much difference with children as they did with adults but could have an effect on comfort and speed. The personal characteristics affecting the responses to print legibility were age, reading ability, and use of magnification. Strangely enough, measured visual acuity is not always a factor in whether or not print is legible to a low vision reader. Similar consideration needs to be given to visibility of other representations on paper, whether prepared by hand or commercially produced. For many learners, legibility may be enhanced by use of a transparent light yellow filter which seems to sharpen the contrast of

the printed material on white paper according to some teachers. (These filters can be obtained at most local camera dealers.)

Means of Magnification

There are three basic means of magnifying any visual image: (a) bringing the object closer to the eye(s), which increases the perceived size of the image; (b) increasing the size of the object to be perceived (relative size magnification); and (c) enlarging the image of the object optically by some type of lens.

The first two means are called nonoptical magnification because the individual has made the adjustment by altering proximity or self or the change has been made in the size of the object so as to permit the naked eye to see it. Getting closer to objects is easily accepted by children who simply adjust themselves naturally in order to see better once they have some knowledge of what things should look like. They accept lenses or aids if they help and reject them if they don't. However, the learner needs to know what objects look like without aids and needs to know how to use aids successfully before their rejection can be accepted as meaningful. Up to adolescence, and possibly beyond, many low vision learners with measurable acuity may not actually need optical magnification—they just use the natural magnification of proximity (Faye, 1975). The angle of light on material needs careful consideration when it is brought close to the face so that shadows are not cast on the material to be examined.

Increasing the size of materials requires some alteration of the material into a different form such as actually printing material in larger type (enlarging the original photostatically) or drawing larger objects with felt pens. A newer method for enlarging images involves the use of a closed circuit television system.

Two other factors need to be considered in nonoptical magnification—lighting, probably the most important nonoptical means of changing image perception and the use of pinhole templates or typoscopes. Pinhole spectacles may be prescribed but a pinhole template can be held to the eye to permit sharpening of the visual image. The typoscope is usually a black card with a viewing slit of from 3 to 7 inches horizontally just wide enough to expose a line of print. The reduction in glare from the surrounding area increases contrast and the reader can move it along the line and down the page as reading continues.

Visual conditions vary among individuals depending on the nature and cause of the impairment. Some learners have greater need for magnification at near point than at distance; others have need for magnification at distance but function well without it at near point. Optical magnification may range from simple nonprescriptive magnification achieved by use of a hand or stand magnifier to sophisticated optical systems individually prescribed for performance of specific visual tasks. Some of the more important considerations of all of these will be discussed in the next section.

Low Vision Aids

Almost all types of magnification and optical aids for use of low vision learners have some common characteristics. They all influence the learner's

focusing angle and/or distance,

working distance,

field of view,

span of successive eye or head movements,

sharpness of visual image.

Beginning with microscopic aids (near vision), then addressing telescopic aids (distance vision), the important types and features of each will be discussed. Magnifiers for near vision are much easier to select or prescribe than those for intermediate or distance vision.

Eyeglasses (either with single or bifocal lenses) are those which can be worn on the face and head. Some low vision learners wear their glasses all the time and use them in combination with other aids when desired. Some tinted lenses or ones with side shields are effective in reducing glare. Other eyeglasses may be fitted to the face, but worn only for particular types of near vision tasks. Lenses with greater magnifying power may be fitted over glasses only for reading or detail work. Trying to move about wearing glasses with very strong corrective power is very difficult. Eyeglasses rarely can improve central vision (even with high magnifying power clipped on or inserted into the lens) when distance vision is very poor (Faye, 1976).

Even when corrective eyeglasses are worn, the low vision learner may find hand magnifiers very useful. In fact, hand or stand magnifiers may be the only correction which is helpful to some individuals with very low vision.

The power of magnification in hand-held devices may range from 3 diopters to 10 diopters or more. They are used primarily for tasks of short duration and are desirable because they are inexpensive, small, light-weight, and come in different sizes, shapes, and magnifying power. There are single lenses, double lenses, and even triple lenses, some of which require extensive training for effective use. The different types and sizes of hand magnifiers pose problems for some very young learners (as well as older ones) because of the need to hold them at a specific distance from the object in order to avoid distortions. Some need to be held closer to the material. Another characteristic of hand magnifiers is that the stronger the magnifying power, the more restricted the field of view is likely to be, and the closer to the material it is held, the smaller the field of view. More mature learners often like to carry one of these for such quick viewing needs as prices in stores, reference numbers in a library, or any other requirement for which bulkier or heavier devices would be difficult to transport.

There are two types of stand magnifiers—fixed focus and variable focus. Fixed

focus magnifiers come on a stand or are built at a particular height to be placed over objects so that there is a fixed distance from object to lens. These have the advantage of providing a greater field of view for reading or detail work. Smaller ones give a very restricted field, but may be moved along the page, whereas larger ones are bulky and heavy, and are suitable only to be placed on desks or tables. For learners needing high magnifying power, the smaller ones may provide a greater advantage.

Variable focus magnifiers are usually attached to some sort of swinging arm which can be adjusted in height and angle. The individual moves it close to the material or farther away as desired. Bringing the lens closer to the eyes and farther from the material makes a larger image size and increases the field of view as well. These are especially useful in classrooms or in libraries. Some are attached to stands and can be moved to different positions in the room. Magnifiers designed to cover an entire page of reading matter without adjustment, are not useful to the extremely low vision learner (Faye, 1975; Sloan, 1971).

Some specialists prefer that hand or stand magnifiers be prescribed for each individual person so that they may be selected for specific tasks. However, quality magnifiers may be purchased by agencies or schools and made available to learners who wish to try out various strengths and sizes (with and without built-in lights) in order to select the one(s) which are most useful to them. Certainly, in geographic areas where low vision clinics do not exist and eye specialists are seldom available for consultation, having an array of hand and stand magnifiers on hand for use of low vision learners is quite appropriate and is to be encouraged.[14]

Distance aids may include conventional lenses, contact lenses, and telescopic lenses. Generally, when conventional lenses and/or contact lenses are worn for distance vision, they are not considered as optical aids or telescopic devices; and will not be discussed here at length.

Telescopic lenses make objects appear closer and larger and are the easiest optical method of improving very low distance vision when regular eyeglasses will not suffice. The primary objection to telescopic lenses is that the field of view is reduced in proportion to the power of the lens. Some telescopic lenses may be set into the upper portion of the eyeglass lens. These are appropriate only for selected persons who can adjust to the many perceptual and emotional variables involved in learning to use them when needed (Newman, 1975).

Hand-held variable focus telescopes are used for a variety of purposes such as watching sporting events, reading house numbers or street signs, viewing traffic lights, scanning a room, and reading from the chalkboard. Friedman (1976) suggests that every low vision learner (ages 5-13) be evaluated for possible use of optical aids in the educational setting, especially telescopic aids as students can be

[14]See the first Appendix for list of sources.

more competitive if the aids can make information available about the classroom environment beyond the immediate desk area.

Two other types of optical aids of use in stationary position should be mentioned. The rear view projection screen can be used in combination with slides or film strips and can be of great value to low vision learners who cannot see material or pictures projected on a larger screen. Overhead projectors may be used also as optical aids by permitting the learner to look directly into the projector. There may be too much glare for some but others can get general impressions or specific information that would not be visibly accessible to them through any other means. Closed circuit television projection systems, when available, may enable some low vision learners to see material not visible for reading or enable them to see their own writing, when no other optical aid enlarges material sufficiently.

Here Are More Suggestions Regarding Use of Low Vision Aids

- After encouragement to develop natural visual ability to the maximum, low vision learners need to be introduced to magnification as soon as they show interest in making discoveries and are ready to look at objects independently.
- Not all low vision learners need to use or see any better with magnification or optical aids. However, those who do see better with an aid find that simple nonprescriptive magnification is sufficient for several years unless there are problems in handling the magnifiers.
- When possible, and as soon as learners can interpret what is seen (probably from 8-12 years of age or even younger), a visit to a low vision clinic is desirable. Learners can receive an individual low vision examination for evaluation of potential use of optical aids for numerous activities related to living and learning.
- Magnifying devices or optical aids should *never* be given to low vision learners of any age merely in the hope or expectation that they will find some use for them. All low vision learners need time to learn to use the aid or device even with the assistance and guidance of a skilled person to provide adaptive training. Often this help is not available at the clinic or from the specialist. It then becomes the responsibility of a knowledgeable person in the school or agency.[15]
- The types of activities which need special attention in use of optical aids are:
  a. Discovering the wide variety of activities in which an aid may be useful.
  b. Learning to store the aids for accessibility when each occasion demands.
  c. Locating and maintaining focal adjustment for appropriate distances and learning the specific aids most helpful for near or for distance viewing.
  d. Learning viewing patterns at near and at distance so as to locate designated items on the page, chalkboard, in the room, or out-of-doors.
  e. Adapting to limited field and to specialized movement required to track stationary and moving objects.

[15]See Chapter VI.

- As learning materials become more complex, and the range of everyday activities increases, the learner might explore a greater variety of magnifying aids along with various kinds of illumination[16] in order to select the most comfortable combinations for seeing. The observational information derived may serve as a basis for referral to a specialist and provide data helpful in the low vision evaluation.
- Too much emphasis on the use of aids for near work may overlook the value of aids for use in daily living activities. Use of aids around the school or agency, outside on the grounds or street, in public places both indoors and outdoors, and in the home needs to be explored.
- A very important fact must be remembered—low vision aids can only facilitate one's use of residual vision. They cannot provide or restore normal vision. The user needs to understand this.
- The more specialized the aid, the more training is likely to be needed.
- Highly motivated and active low vision learners may require several types of optical aids.
- Some learners may be able to make effective use of near vision aids but are unable to use distance aids to any advantage. On the contrary, other learners may use telescopic aids quite effectively but find the use of near aids of no value.
- No one optical aid is going to be satisfactory for all purposes at all distances for any person.
- Some school and agency personnel need to be *sold* on the idea of magnifying devices (optical aids) and the psychological support needed by the low vision learner in their use. Having them available is a sort of "permission" or "sanction" for their use.
- Many factors influence the use of aids by learners, and may include such things as
  a. Age and motivation
  b. Efficiency in visual functioning without the use of aids
  c. Developed ability of learner to understand and use aids in appropriate manner
  d. Frequency of use and types of tasks for which aids are required
  e. Peer group acceptance
  f. Environmental variations in lighting, seating, materials to be used, and so on.
- Sometimes low vision aids enhance vision enough to allow a person to travel safely and independently.
- Use of magnification may permit low vision learners to use (or transfer to use of) regular type, thus making a greater variety of materials available for learning.

[16]Ibid.

- If extremely low vision learners try very hard to see small objects or classroom materials, use of magnifying devices may encourage looking at detail and eventually at print symbols.
- Every low vision learner deserves the opportunity of trying a variety of magnification devices so as to derive any possible help in use of vision for learning and functioning.

Issues for Decision-Making

Many issues surround this entire topic of reading, magnification, and optical aids. People have their own ideas and no definitive answer to any one of the issues would be satisfactory for all low vision learners. However, some evidence is available from research that addresses several of the more controversial points. Only three of the topics which seem to be of greatest concern will be discussed here, (a) the issue of appropriate type size—regular or large type, (b) closed circuit television systems as the only means of print reading for some school age students, and (c) selection of an appropriate reading medium for low vision learners.

For years, some have thought that there should be instantaneous improvement by use of large type—a naive assumption that reading efficiency was related only to the size of the material to be read. Studies prior to 1970 found no significant differences in reading speed and comprehension between 18 and 24 point type sizes, and that no size between 12 and 24 point type could be considered superior for all low vision readers (Nolan, 1959). Fonda (1966) suggested that the usefulness of large type was probably exaggerated, and that some learners were forced or encouraged, because of custom, to use large size type when they could read regular size type more easily. Recent studies (Bock, 1971; Sykes, 1971, 1972) have concluded that no relationship exists between type size, reading speed and comprehension, and visual acuity among low vision print readers.

A few teachers and some optical specialists (Sloan & Habel, 1973) indicate that there are some advantages to use of large type

1. Close reading distances for regular size type create too much fatigue.
2. With large size type, individuals can work without magnifiers.
3. Typing and copying requires that material be farther away.
4. Some learners cannot see regular size type, but can learn to read large size type.

The disadvantages of large size type have been summarized by Stokes (1976) as:

1. The learner sees less at one glance and may skip lines, which makes reading slower.

2. The head sweep time required for each line of reading is time consuming and tiring.

3. The books are large, heavy, won't fit into desks (lockers), and aren't what "other kids" are reading.

4. Most large type books have no color pictures, a highly motivating and clarifying feature for younger learners.

5. The selections available in large type are very limited, and the material is often out-of-date.

6. Some learners perceive a stigma attached to large type, and attitude conveyed by some regular class teachers.

Even though the issue may not easily be resolved to the satisfaction of all concerned, it would be logical to provide the greatest variety of type sizes available along with numerous magnification devices of various strengths and permit each learner to try all options. The early primary-grade readers use books printed in 18-24 point type.[17] A few low vision learners may need larger type or stronger magnification until recognition and interpretation of words is well established and texts can be read at grade level. At about third- or fourth-grade reading level, when learners have been given all possible choices, the type size and magnification for each reader will be more easily determined. Some will read regular type for general reading assignments and larger type for studying such subjects as math and science. Others will prefer to read regular type for shorter assignments and to use magnification for greater comfort and efficiency when reading fatigue is experienced. For those who may not be able to read regular print, even with the usual optical aids, other alternatives will need to be explored. The teacher's attitude, encouragement, and assistance in devel-opment of visual efficiency are influential factors.

The second issue revolves around the use of closed circuit television systems as the only print reading medium for selected students. Several companies are manufacturing such systems under specific trade names. Although there may be unique characteristics associated with each of the different systems, the basic principle is the same. A television camera is mounted on a stand and the image upon which it is focused is displayed on a TV screen.

This magnification process has several advantages over other types discussed previously.

1. The degree of magnification is greater than optical aids can provide. The potential for enlargement is from 5 to 80 times the original size.

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[17]There is no hard and fast correlation between type size in points and height of the actual letters in fractions of an inch. For example, among 18 point types, the height of a capital letter may be as little as 1/8 of an inch or, in a different face, as much as 3/6 of an inch, a difference of 50%.

2. A reverse polarity feature gives either a white on black display or black on white with the flip of a switch.

3. Handwriting can be monitored as it is being done and hand written materials can be read.

4. The camera can be focused on any object, person, or material within range.

Major disadvantages are the high purchase price and consequent limited access, as well as the lack of portability of the system. Even if placed in the library for use of everyone, there may be only one or two learners who actually have need of such a sophisticated system.

The issue being faced by some schools and agencies is whether the advantages of a system that permits a small number of low vision learners to use visual materials can be reconciled with the expense and if not, to what extent are these learners being deprived of visual learning which could be available to them with the system. Some reasonable questions might be asked:

1. Can a closed circuit television system be considered an educational necessity when little or no visual materials can be discriminated and interpreted by a low vision learner without it?

2. Is it appropriate to teach someone to use visual materials with a closed circuit system when there may not be a system available in any other setting in life? What if the learner moves to another school and no means of visual reading is available?

3. Upon what individual learner characteristics will the decision be made?

4. Will the learner gain a false perspective of visual functioning abilities in other areas of life if dependency on exclusive use of visual materials is fostered in school settings?

To this point, there are a limited number of experimental classrooms using closed circuit television systems (Genesky, Peterson, & Yoshimura, 1978). As yet, no control research data is available. Nevertheless, many schools and agencies, as well as state departments of education, are being pressured to purchase such systems. The moral and/or legal consequences of not providing for the needs of individual students or of trying to justify to other parents and the community at large the expenditure of large sums of money for this equipment for very few users, may be overwhelming.

The final issue to be discussed is related to selection of appropriate reading media for low vision learners who are neither exclusively tactual or visual learners. Learners with extremely low vision who try to look and see objects or materials but have great difficulty doing so may pose a dilemma to themselves and to their instructors. The question asked most frequently is "Should this learner use print or braille for reading?" However, this may not be the question which needs to be

asked. A more logical question might be this: "How much learning and educational work is an individual able to accomplish through use of the visual sense, and what can the learner do more effectively through use of the tactual sense?" Even that question is not one to be answered immediately or even over a short period of time.

Henderson (1973) advocates optimum use of print even when there is a very small degree of vision. A good rule of thumb may involve careful scrutiny of the individual learner. If a learner tries to look at materials including braille then print is a more feasible medium for that learner, at least at that time. Many factors other than severity of impairment or acuity need to be considered (a) near point acuity and accommodative power, (b) visual efficiency for resolution of detail, and (c) general ability and readiness for reading. Henderson further suggests that a combination of both print and braille media may be appropriate to try with some low vision learners especially those who are interested in "looking" and are eager to use their vision. Young learners may begin to show a definite preference for either braille or print in a few years. Some may continue using both media through school years and later in life.

Reading both print and braille may increase overall learning efficiency and functional capacities. Although some parents and teachers question the feasibility of this approach, claiming that learners will be confused by using both media, there is no empirical evidence to verify such a concern. In fact, many teachers have observed that average and above average learners utilize both print and braille with no difficulty. They choose one or the other as the situation demands, with the privilege of selecting the best reading medium for a given circumstance. Arbitrary decisions about tactual or visual reading (learning media) made by teachers or other adults cannot be justified. Flexibility and involvement of learners in determining what is best for each individual is an important consideration and is, in fact, part of a recent legal mandate. Forcing learners to make a decision for either print or braille reading may be detrimental to motivation and to individual learning needs and desires.

Sykes (1972) suggested that the inability of some learners to read print as rapidly and efficiently as teachers expect may be due, in part, to cognitive immaturity, lack of verbal skills, a dearth of social experiences, true learning disabilities, and insufficient exploratory and movement skills. Such factors need to be carefully weighed in evaluating any learner who is experiencing difficulty in learning to read. According to Scholl (1975), every low vision individual needs to be encouraged to do as many visual tasks as possible, including reading. When an average learner's ability to read print is not in keeping with his or her demonstrated mental ability, then supplementing visual learning with tactual learning and braille may be appropriate. Teachers need to be sure that the reason to use braille to supplement visual reading is because of the learner's inability to see the print rather than general lack of readiness to learn

to read. Learners below-average intelligence with useful vision should have much greater emphasis placed on visual learning and print reading since few will be able to use tactual learning or braille very efficiently.

Barraga (1976), in summarizing all the issues discussed, came to the following conclusion:

> Rather than continuing to engage in argument in an attempt to establish the superiority of one type of material or one means of enlarging reading material over another, a more reasonable approach is to try all materials and devices that might facilitate a higher level of visual functioning in all visually handicapped children.

VI

Interdisciplinary Communication and Cooperation

Adults who work with visually handicapped persons all have at least one common concern—the progress of low vision learners. The effectiveness of the communication between and among the various persons who may be involved has much to do with the learning progress and the functional efficiency of low vision individuals.

Specialists in different disciplines perform their roles as they define them unless careful attention is given to organizing and implementing a system of intra- and inter-disciplinary communication. When only a few persons are involved communication is seldom a problem. In cases where there are several specialists involved with low vision learners, communication may neither be effective nor consistent. Information given a learner or the learner's family may be conflicting, confusing, and unrelated to any overall educational plan or learning objective. When this happens, it is given a real disservice. Rather than receiving helpful assistance, learners and parents hardly know who to believe, much less whom they should listen to.

Before planning an individual program for a low vision learner, those specialists who are most likely to be involved need to be identified and the specific roles they may be expected to perform discussed.

Specialists and Their Roles

Probably the most crucial specialists involved in the communicative process are the *parent(s) families, and/or caregivers* responsible for the daily, long term loving care of the learner. (In residential schools, these may be dorm parents.) Because low vision learners spend only a portion of their waking hours with the other specialists, the parenting persons play the most important role. In relation to this interactive communication process their role(s) may become more or less assertive depending on the situation and other personnel available. Generally, their expected role is that of

- Providing a healthy, organized living environment in which the learner is comfortable, can satisfy physical needs, and is encouraged to develop increasing independence and responsibility.
- Sharing any information about the personal feelings, habits, and attitudes of the learner that may be important to health and educational progress.
- Cooperating with other specialists in encouraging and supervising the learner in use of vision in all functional and learning activities in the home or dormitory.

- Asking questions of any of the other specialists about the learner or any physical, visual, or learning problems which are not clearly understood.
- Supporting and following through with any special activities suggested by clinical or educational personnel for the benefit of the low vision person.
- Participating in activities designed to promote understanding of factors related to functioning with low vision such as simulation exercises.

Diagnostic and Assessment Personnel Primarily, these are the specialists who identify the present level of functioning, learning characteristics, and experiential factors which may influence the development and educational progress of low vision learners. Assessment of learning potential and educational achievement is a team responsibility.[18]

Vision Specialist(s) Vision specialists are the persons who have primary responsibility for determining the unique needs of visually handicapped learners including those with low vision. The contributions of these specialists depend on the type and number of other specialists available, the length of time visually handicapped students have been served in that setting, and the number of low vision learners in a geographic area. Visual specialists may support and consult with parents, classroom teachers, other diagnostic personnel, and administrators. Such specialists may fulfill their roles by doing some or all of the following:

- Supporting regular educators, administrators and teachers, in any and every way possible for the mutual benefit of the learner and the other school personnel.
- Maintaining an advocacy position for the unique needs of low vision learners in all areas of life.
- Acting as liaison persons in communication among specialists in other disciplines and in some cases between specialists and parents or learner.
- Participating in educational assessment and placement in a program most appropriate for a specific low vision learner.
- Assisting classroom teachers in planning programs and methods for low vision learners.
- Providing suggestions and encouragement to make other learners aware of the capabilities of their low vision peer and to understand that being different is not being "less than."
- Working with mobility instructor(s) in conducting vision reduction simulations with sighted children, regular class teachers, and/or parents.[19]
- Assuming responsibility for teaching the low vision learner such as visual development, use of optical aid(s), typing, computing on the abacus, use of

[18]Such a team may consist of vision specialist(s), resource or itenerant teacher, psychologists, psychometrics, and/or education diagnosticians.

[19]Sources for materials to be used in such simulations will be found in the fourth Appendix.

tape recorder or other equipment, and orientation and movement in building, etc. needed by the low vision learner.

- Adapting or providing any specially prepared materials needed by learner or teacher in the classroom.
- Devising means for acceptance and participation of low vision learner in all phases of school life and in special programs and nonacademic classes.
- Giving objective, accurate feedback to the low vision learner(s) on behavior and educational progress.
- Teaching concepts related to academic work which the low vision learner does not have or has difficulty in acquiring.
- Supporting the administration, other teachers, parents, and low vision learners at all times to assure continuing progress and enthusiasm (Corn & Martinez, 1977; Martin & Hoben, 1977).

Psychologists These specialists assess and interpret information about personal and intellectual behavior and counsel individually with learners and/or parents about information revealed in the assessment. *Psychometrists* are specialists in selecting and administering psychological and educational measures and drawing conclusions about the possible capabilities of individuals. Their reports are available to other professional personnel. *Educational diagnosticians* are specially trained to administer educational assessment instruments and to assist teachers in developing realistic educational plans.

Roles of these psychological and educational specialists may vary from community to community and among schools or agencies depending on who is available and the specific needs within an area. Usually one or more of them is available to perform some or all of the following:

- Selecting and adapting appropriate assessment measures to gain the widest range of valid information about learners.
- Enlisting suggestions and assistance from other specialists in the administration and interpretation of assessment measures.
- Providing teachers with specific recommendations regarding a learner's strengths and possible weaknesses in learning and thinking.
- Participating in discussions with those making decisions about the academic placement and learning need of low vision learners.

Eye Specialists They diagnose the nature, extent and type of physical problem found in the visual system, and provide surgical or corrective means of minimizing the visual problem. This group may include eye specialists such as ophthalmologists, optometrists, opticians, and/or ophthalmic opticians. (Definitions of these terms may be found in the glossary.) The roles of these specialists vary in specifics, but all of them need to share the following information with learners, their families, and educational personnel:

- Medical diagnosis of the nature of structural defects or disease, and a description in functional terms of the part(s) of the eye affected.
- Location of central and/or field defects and the possible interference with close work, sports, or travel.
- Accurate acuity measurements for distance and near vision. If lenses are prescribed, there should be communication as to when they are to be used and the possible effect on performance of specific visual tasks especially in distance viewing.
- Amount of accommodation available to person for close viewing with or without prescriptive lenses.
- Prognosis for stability or progressive deterioration of condition and function.
- Any evidence of nystagmus or photophobia and the interference expected in functional activities.
- Any need for learner or parents to confer with other specialists who may provide consultative and/or nonmedical services.

The roles of various specialists may be adjusted depending on who is available and the roles defined by the specialists themselves within their communities. Some specialists may set aside specific times for exchange information with parents or vision specialists, either in person or by telephone. When ophthalmologist are consulted, they may decide to make the medical diagnosis, then refer to an ophthalmic technician or optometrist for more detailed refractive work, especially when no surgery is indicated, or after surgery. If an ophthalmologist is not available, then an optometrist may be able to prescribe refractive lenses or optical aids to improve functional vision. If disease is present or surgery may possibly be indicated, they refer the learner to an ophthalmologist in the nearest community. Some optometrists grind and fit lenses and optical aids whereas others prefer to do the prescribing and let an optician make and fit the lenses or dispense the aids.

Educational Personnel The most important of these specialists are administrators and classroom teachers. The *administrator* is the person who directs programs and staff in a school or agency delivering direct service to low vision learners. Administrators usually manage funds and personnel, facilitate program implementation, and make final decisions on services to be provided and those to be served. *Classroom teachers* are responsible for a group of learners for one or more periods or for the entire instructional day. Classroom teachers (sometimes referred to as regular class teachers by special educators) may have one or more visually handicapped learners in the class. The primary role of the classroom teacher is to provide an educational environment in which the unique learning needs of all learners can be accommodated. When low vision learners are present,

the classroom teacher may be expected to adapt by

- Assuming the major responsibility for knowledge of subject matter and academic progress of all learners in the class.
- Assuring that all information and activities are as available to low vision learners as to others.
- Expecting a level of achievement for low vision learners comparable to the standards set for others unless the vision consultant has suggested otherwise.
- Insisting on the learner's increasing independence, self-direction, and responsibility for performance and learning.
- Asking questions of parents and specialists, etc. without hesitation.
- Adopting a positive attitude and helping other learners to think of visually handicapped learners as one of the group.[20]
- Making adaptations in methodology, materials, time, and space necessary to facilitate participation of those with special needs (Martin & Hoben, 1977).

Some classroom teachers have defined far broader roles for themselves as they begin to feel more comfortable in including low vision learners. Each situation and every teacher will be different so that the above suggestions should be considered as guides rather than rules to follow.

Other Supportive Personnel The specific needs of low vision learners help to determine the desirability of consulting other supportive personnel. Many low vision learners need to learn independent travel skills from an *orientation and mobility specialist* whose role will be to teach the use of low vision while moving in the environment, the use of optical devices for independent travel, and how to travel safely in relation to functional use of vision.

Other supportive services for learners, parents, and vision specialists may be provided by *counselors, social workers* or *visiting teachers, nurses, physical,* and *occupational therapists.* Some of these persons may be needed for periodic consultation only, but others may be required for continuing periods of time. The vision specialist(s) can be very effective in developing the liaison and communicative process with supportive personnel.

Ideally, all of these specialists would be able to work as an interdisciplinary team. Time demands and availability do not always permit a true team approach to communication on a regular basis. For this reason, the vision specialist may be the primary coordinating person to see that information from various specialists be directed to those who have need of it. When this is feasible, then selected persons may meet when appropriate or when the coordinator thinks that face-to-face communication would benefit the low vision learner or parents. There are some

[20]See Chapter II.

specific types of communication between certain of the team members that seem to be imperative for effective communication.

Communication of vision specialists with teachers and medical or clinical specialists

1. Agreements as to when either might be accessible to the other on a regular basis need to be made. For example, when a teacher may call the eye specialist for telephone consultation, or vice versa, should be agreed upon.

2. A decision as to whether or not any or all concerned should accompany a low vision learner and/or parents to office visits or to low vision clinic for sharing of information.

3. Agreement must be reached on the use or nonuse of certain terms; (ex. "legal blindness" for the low vision person) which may communicate negative rather than positive attitudes about the low vision person.

Communication of vision specialists with regular classroom teachers

1. Arrangements for consultation before the opening of school should be made so that each can understand the expectations of the other in relation to the learner(s).

2. A tentative schedule must be planned for 1-5 minute regular "exchange of information" sessions, at least for the first few weeks, or during times when special problems may arise.

3. A clear understanding should be reached as to what the classroom teacher can expect in the way of direct or consultative service, preparation of materials, and individualized instruction from the vision specialist.

4. An agreement should be made as to where, when, and what kind of contact the vision specialist is to have with the low vision learner. Sometimes the classroom teacher may wish the specialist to work individually with a learner during a lesson in the classroom such as when using a telescopic aid to work from the board. Other times the classroom teacher may wish the specialist to take the child to another area to work on visual development or typing skills.

5. Any concerns, anxieties, or lack of understanding should be talked out.

6. A reasonable, realistic set of standards should be set on what can be expected of the low vision learner so that these standards can be communicated to supportive personnel, other students, administrators, parents, and learners themselves.

7. An attitude of shared commitment to participation of the low vision person according to specific learning needs should be shared.

8. Agreement on the appropriate use of specialized equipment within the classroom should be firmed up.

9. The degree of independence and responsibility to be expected of the low vision learner should be spelled out.

10. A mutually acceptable plan needs to be devised for educating classmates about the needs of a low vision person, the special devices or equipment needed by that person, and the appropriate responses to questions and natural curiosities.

Communication of vision specialists with parents

1. A clear understanding should be agreed on regarding the type of concerns or problems to be communicated directly to the classroom teacher. Usually this includes any matters relating to academic performance or behavior in the classroom setting.

2. A mutually satisfying arrangement is desirable for communication between parents, vision specialists, and/or medical or clinical specialists relative to eye conditions, treatment, use of lenses or optical aids so that the learner receives the same information from each.

3. An agreement needs to be worked out regarding the specialized learning skills needed by the low vision person for maximum functioning and a plan drawn up for learning and practicing these skills away from school.

4. A satisfactory plan should be agreed on for consultation and/or referral to agencies for additional specialized services.

5. A plan should be drawn up for encouragement and instruction in use of low vision in personal and home activities as a supplement to use of vision in academic work.

Communication among those providing service to low vision learners can be done in many ways including face-to-face consultations for a few mintues at a time, telephone contacts, notes, and certainly video-tapes. All or any combination of any of these will be to the advantage of the low vision learner.

Multidisciplinary Work with Low Vision

The model for a multidisciplinary approach described here is based on one developed as a cooperative effort between a team of eye specialists and personnel at the Illinois School for the Visually Impaired (Taylor, 1978). The primary objective was for teachers and mobility instructors to maximize the efficiency of low vision learners by teaching them how to look and to use natural visual potential in all activities prior to examination for additional prescriptive optical aids. After referral to the low vision clinical team and prescription of appropriate aid(s), teachers and mobility instructors worked with learners during a period of postadaptive training. During this time, learners explored the use of aids in

performance of specific tasks under the guidance of someone capable of making suggestions for adaptations. Educators communicated to the clinical team any special problems or needs of individual learners.

One important aspect of interdisciplinary work was understood by teachers when they recognized the importance of their role in relation to the clinical team. Roles varied depending on the type of communication which already existed with other members of the team and the proximity of the examining specialist(s). Educators played a definite role in the interdisciplinary model in the following areas:

1. Providing observational data concerning present visual functioning of the learner being referred.

2. Accompanying learners to low vision evaluations by eye specialists, mobility instructor, or whomever was involved.

3. Maintaining close communication with the examining eye specialist regarding (a) the type of aids prescribed, (b) focal length of the aid or magnifying lens, (c) problems learner encountered in learning to use the aid, (d) restrictions or suggestions regarding length of time to be worn or used, (e) development of individualized program to help learner gain optimum use of aid(s) in as short a time as possible, (f) management and care of aid(s) for accessibility when needed, and (g) periodic reports to the eye specialist.

In the model described, continuing communication was needed after the learner showed progress in postadaptive training. The eye specialist wanted to know about the performance and behavioral responses manifest when using vision. Some prescriptive changes were indicated as a learner improved in visual efficiency, matured physiologically, or had increased needs because of visual functioning in a greater variety of environments.

Parents played a very important role on the team especially by insuring that the learner used vision and aid(s) consistently and appropriately when away from the supervision of the eye specialist or instructor. They had opportunities to gather information concerning functioning environments outside the educational setting.

The low vision learner was the key member of the team. Regardless of the knowledge and expertise of the eye specialist in fitting and prescribing the aid(s) and the information gathered by observation, the person doing the looking and seeing was the only one who could determine the effectiveness of the team effort. Not only did the learners have to manipulate the aid(s) for the clearest image, but they developed patience, tolerance, and a satisfying self-concept through actual practice and positive reinforcement. Unless the learner had the desire to work cooperatively as a member of this team and communicate both problems and successes, the entire effort had little value.

Good communication among all concerned was achieved through personal con-

ference, individualized check lists, and written reports. Whenever there are several specialists from different disciplines involved in various aspects of the learning process of low vision individuals, communication among them is imperative. Progress and efficiency can be achieved and the "whole" person developed or maintained only through such a process.

VII

Suggestions for Helping Low Vision Learners

How can parents, teachers, and other professionals help very young low vision children? School age children? Multihandicapped individuals? Older persons? Here are some practical suggestions for working with individuals in each group.

Preschool Children The first group comprises of very young children (0-5 years) and their parents. For various reasons, this population is continuing to increase and requires very special consideration to assure that parents are alerted to look for any possible visual response. These early years are the most crucial years for sensory stimulation and perceptual development.

At birth, about the only thing that can be determined about vision is whether or not the eye and its internal structures are functioning with a reflexive pupillary response to light. Unless a problem is suspected, casual observation of visual responses may not alert parents or specialists to the possibility of abnormal or missing internal structures in the eye for several months. Even then, missing or abnormal structures may permit development of usable vision with careful attention to stimulation.

Children with extremely low vision may be a real puzzle for parents as well as clinical diagnosticians. The following specific suggestions may be helpful to parents and others working with preschool children:

- When a baby or child turns to light or blinks in bright light, realize that some usable vision may be present. Even though an infant may have been diagnosed as "blind" at birth, exposure to penlights, flashlights, and bright sunlight stimulates the eyes to blink or to open and permit light to enter.
- In waking moments, when baby's eyes remain open, even for brief seconds, or when the head turns in the direction of light, dangle and move all kinds of light reflecting objects back and forth in front of the eyes close to the face to stimulate looking.
- Hang all sorts of designs, faces, and bright objects around the crib. Mixed colors or black and white are most visible. Looking causes the infant to use eye muscles to try to focus, refocus, and fixate on shapes, colors, and patterns.
- Move things back and forth slowly to encourage the eyes to follow objects. By 4 months (if not earlier) help the baby to reach out to objects and bring them close to the face.
- Even though there is little response, continue the stimulation several times a day. Things will begin to emerge from "the fog" and looking may begin to be very satisfying when there is something to see.
- Help the baby who is beginning to move to reach, crawl, or move close to

objects. This encourages the motor system to begin to coordinate with the vision system in the latter part of the first year.

- When standing is possible, tactual combined with visual stimulation provides a reason for learning to move forward to something.
- Provide plenty of freedom to move, explore, and look and touch simultaneously. Vision begins to develop more consistently when toddlers provide some of their own stimulation by moving and looking. Continue to say "look" frequently, calling attention to things to see.
- Encourage outdoor exploration in the yard and in parks and playgrounds. Bumps, bruises, and minor abrasions are a part of all toddlers' lives and low vision is no reason to restrict movement.
- Constantly call attention to interesting things so the low vision child does not miss things seen only by moving close and touching. Try to think less of the child's impairment than his or her need to search visually in order to foster learning to see.
- Point to pictures of familiar things on pages in books and magazines. Bring them close to the baby's eyes to encourage looking. There is a definite relationship between the use of vision and the spontaneous progress in perceptual cognitive development.
- Permit ordinary falls caused by misjudging distances or failing to see an object. Otherwise the child never learns how to look in order to move independently with efficiency. Overprotection of a child creates dependency, limits exploratory and movement activities, and slows development of important functional skills.
- Teach young children that there is something to see and how to look. Looking is needed for the low vision child to fill the brain with visual memories. At first, children are not aware of the impairment, but just see what is possible.
- Realize that acuity measurements have no meaning before 4 or 5 years of age (Seidenberg, 1975). Even though a child does not look directly at parents or objects, it does not mean that he or she is not seeing. Adults need to move close and encourage eye contact. The exact visual state cannot be determined with certainty in infancy or early childhood.
- Try to remember that the experience and the process of learning are far more important than how well a child is able to see to perform a task or how he or she appears to others. Parents may wish, consciously or unconsciously, for their child to look "normal" and inadvertently discourage looking or holding things close because they may appear different and cause people to ask questions.
- Help low vision children enjoy seeing by making looking and discovering a game which is fun to play.

The more encouragement to look and move in these early years, the better chance the child will have to use vision meaningfully later on. Several pamphlets are available which give suggestions for other activities (Drouillard & Raynor, 1977; O'Brien, 1976). Early childhood personnel may find that scales designed for children without impairments may be useful as a guide in assessment of low vision children when appropriate adaptions are made (Bayley, 1969; Griffin & Sanford, 1976; Uzgiris & Hunt, 1975).

School-Age Learners Parents and families (including houseparents in residential schools) play an important role in fostering visual development especially for functional purposes. At both elementary and secondary levels, classroom teachers and other educators need to understand the unique characteristics of low vision learners and support and encourage them in use of vision for academic tasks. The following suggestions will be divided into those most related to functional activities followed by those most appropriate to academic tasks, and finally, some general proposals applicable to both families and educators.

Functional Activities These suggestions center on the visual tasks performed in personal care, during play, in movement in the home and school setting, and in general participation in the neighborhood and community:

- Teach children and youth to know about their own impairments and what they can see well. They need also to know what they do not see well so that they can answer questions and make appropriate requests for assistance when they begin to play with other children.
- Try to develop a support base for low vision learners by providing some interactions with others who have similar problems. This helps to prevent a feeling of being different from everyone.
- Teach low vision learners to work at maintaining eye contact with objects and especially with people. Verbal interaction with someone while looking fosters recognition and helps them to remember what has been seen.
- Help low vision learners to develop bahaviors and skills that will enable them to participate with peers from the early stages of play to physical and recreational skills. Important social skills will then be easier to acquire.
- Give encouragement to coordinating movement with vision, especially when using the hands in such activities as combing hair, putting on clothes, placing objects together, coloring or painting, and making designs or assembling puzzles.
- Try to provide light and dark contrast between objects and background for functional activities. For example, to make eating easier, use light plates when food is dark, and vice versa.
- Help the learner inside and outdoors by pointing out distinctive features such as color, form, line, etc. At the same time, encourage the learner to touch while

looking so that discriminations can be made between objects in the environment.

- Teach safety. Point out danger areas in the neighborhood so that learners may move freely in daytime and at night. Answer any questions about locale and point out landmarks and visible cues.
- Invite occasional watching of color television to stimulate visual development. Low vision persons may sit as close to the set as necessary. They can focus on interpreting the action more easily when the sound is low or completely off.

Academic Activities These suggestions are related primarily to near vision tasks such as looking at learning materials, reading, writing, and making computations. The ideas may be helpful to classroom teachers and will probably be of value to supportive educational personnel as well. Since parents will be concerned with the performance of many near vision tasks in the home, they, too, will find these suggestions helpful.

- Try to learn as much about the nature of the visual impairment as possible including the effect on visual functioning. Encourage each learner to explain his or her condition to peers and to tell others what can and cannot be seen.
- Make "looking and seeing" fun—never push or pressure—just encourage.
- Take time to look at books and magazines with the low vision learner and point out familiar objects. Ask learner to describe what is seen and select distances most comfortable for viewing. Ideas and attitudes of others can be communicated subtly to the new vision learner.
- Encourage learners to look even though there is no certainty that they can see objects or pictures. Not to encourage learners to always look is to deprive them of opportunities to function visually (Martin & Hoben, 1976).
- Remember that prolonged use of low vision may result in temporary reduced efficiency because of fatigue.
- Be realistic in expectations of visual performance. Help learners realize and understand how what they see may be different from what others see. Emphasize accurate visual impressions and encourage improvement when some work is below expected standards.
- Become acquainted with the magnification devices available and support their use during academic work and at other times.
- Maintain maximum communication with the vision specialist (teacher consultant).[21]
- Some low vision learners read very slowly, often moving the head or book instead of the eyes. As they tire, they may lose their places, skip lines and/or read less well. At this point, a change to less visually demanding tasks is wise.

[21]See Chapter VI.

- Realize that being able to read print, either for short periods or consistently, may not mean that low vision learners are efficient in other visual activities. Discrimination and recognition of detail in other academic work and in additional visual tasks needs attention also.
- Try to avoid work on highly polished surfaces, in shadows, or in areas with any glare. Use natural light when possible. Even lighting surrounding the learner best in both natural and artifical lighting.[22]
- Teach cursive writing or some form of modified manuscript. This is easier than conventional manuscript writing for low vision learners. Encourage working at the chalkboard. The contrast on a chalkboard is good, the position is ideal for efficient use of vision, and it is motorically easier and comfortable. Even if writing words is difficult, realize that writing number symbols and computation work may be possible.
- Encourage the vision specialist or other qualified person to teach the student touch typing as soon as possible (by fourth grade) for two basic reasons (a) development of greater independence in preparation of classroom assignments, and (b) handwriting may be too slow and laborious for long assignments. Magnification or optical aids may be useful in reading what is typed.
- Arrange, if possible, to have tests, duplicated materials, graphs and maps enlarged.

All Low Vision Learners Some general suggestions about use of low vision and efficiency in visual functioning regardless of age or developmental level follow. They are important for parents, teachers, and others involved with the learners.

- Think of low vision learners as seeing persons. Help them to think and behave as individuals who see.
- Use the word "see" just as freely as is done with those who have less impairment.
- Realize that the visual sense functions best in concert with other senses, the motor system, and along with social and emotional development. As visual functioning increases, steady progress in other areas of learning is more apt to occur.
- Be aware of the fact that there is a difference between never having had good vision and in losing vision after the age of 2-4 years. This difference is definitely related to efficiency in learning and is involved equally in motor coordination.
- Asking the low vision person "what do you see?" Answers will provide insight into the accuracy of visual impressions.
- Work on the principle that the more visual efficiency the low vision learner

[22]See Chapter V.

develops in "real life" situations during prereading years, the greater the potential for learning to use print for reading.

- Realize that low vision persons may tire easily because of the extra energy used in looking and interpreting from very little visual information.
- Expect responses to visual stimulation to be slow. The more looking there is, however, the faster visual functioning will develop.
- Encourage low vision learners to be persistent and searching in a desire to see. Vision fluctuates from day to day and emotions, reactions, and performance may vary accordingly. Each learner is different in how and what is seen.
- Take cognizance of the fact that there may be blurred or distorted perceptions or inaccuracies in visual cues. Monitoring surroundings, anticipating others actions, and making changes in tasks quickly are difficult.
- Expect the low vision learner to use vision at all times and for all activities, but be ready to help interpret and clarify the blurs, distortions, and misconceptions which may be evident.
- Learn to ignore negative comments about the low vision individual. Do not fail to provide objective information to other professional observers as appropriate.

Moderately and Severely Multihandicapped Individuals The population of moderately and severely multihandicapped may represent a considerable proportion of preschool and school-age visually handicapped learners. The fact that definitions of multihandicapped are so varied and imprecise could be an advantage when personnel in each program interpret the term in a way that permits delivery of maximum service to those who need it. A disadvantage would result when the use of the term creates erroneous labeling of children whose development is slightly different only because of environmental conditions. The term multihandicapped, as used here, is defined as *those who have physical, mental, and/or emotional problems in addition to visual impairment which interfere with continuous progress in development and learning.*

The complexity of physiological problems, the lack of precision in medical diagnoses, and the difficulty in arranging for diagnostic teams for long term evaluations makes it difficult to assess the multihandicapped person and to plan for appropriate interventions. Medical attention to survival may well be the time and energy consuming concern of parents and children for several years. However, any improvement in vision may well be the most rewarding sensory input available for these persons. Individuals with severe motor problems may be able to interact with the environment for some learning even though independent mobility is restricted. Persons whose organic problems may limit understanding, use of abstract language, and cognitive development may learn much by looking and imitating. Many of the suggestions made for very young children are appropriate to consider along with the following additional ones.

- Expect slower development in seeing because of slower development in all areas, especially the sensory-motor. There will be great difficulty in organizing basic visual functions and performing visual tasks. Emotional states and medications are also factors to consider.
- Focus on maximum visual development along with motor development prior to any attempt to teach symbolic language. The objective is to establish order in a very confusing world through use of remaining vision.
- Make allowance for the difficulty of assessing visual functioning. It takes much time, needs to be done in varying body positions, in both indoor and outdoor environments. It must include many different stimulti in numerous sessions.[23]
- Be aware that diagnostic team work is extremely critical with this population. Unilateral evaluation by any one member of any specialist group should be avoided as much as possible. Functional evaluation of learning potential is the goal, and may take as long as a year or more (Dubose & Langley, 1977; Efron & Duboff, 1975).
- Proceed on the assumption that, "deaf-blind" learners have usable vision. Intensive focus on visual development may be the best means of establishing communications as a basis for self-directed behavior and independent functioning.
- Plan activities to foster visual development carefully in very small increments. Focus on only one visual task at a time, using the simplest language possible. Since it takes longer for a multihandicapped child to respond, be patient and wait longer for responses or consider the use of coactive movement activities to elicit responses.
- Remember that visual behavior in performance of tasks can never exceed the level of cognitive development of the learner. But, as progress in overall development is noted, then more can be expected in visual functioning.
- Allow for the fact that multihandicapped individuals, who are older chronologically but have never used their vision may progress steadily and at a faster pace in visual development when an orderly, understandable sequence of tasks are presented. Some may even be able to make use of magnification and/or low vision aids for functional purposes, if not for reading.

Older Low Vision Persons — Among the population beyond school age, many receive services in community and/or state agencies. Some individuals will have had low vision all their lives (congenital) but will not have learned to perform many visual tasks. However, the majority will be adults who have experienced visual loss (adventitious) because of accident or disease. Learning to use vision more efficiently will be different for these individuals. For those with congenital

[23]See the volume on the Diagnostic Assessment Procedure.

visual loss, the process will be similar to that experienced by younger learners. Never having used vision leaves individuals underdeveloped in visual perceptual functions. Most of the visual functions will be uncontrolled, and performance of visual tasks will be possible only to the extent that perceptual-cognitive development through the visual sense can progress. Major modifications will be needed in the materials used, the level of interaction with the instructor, and the emphasis on functional tasks, especially when there is little interest or desire for visual reading or when vision is extremely low.

The use of vision for those with adventitious loss is somewhat different as are the considerations and concerns. The geriatric population, the largest number of the low vision population, have quite different needs. The great majority have begun to lose efficiency in visual functioning after having had sharp, clear, vision in previous years. Problems of working with them are many, and little is known about the effects of continuing instruction. Among older people, the attitude and motivation to maintain independence and continue participation with others is a big factor in working on a plan for continued use of vision. The following suggestions may be of value in thinking about the older population.

1. Support and encourage in personal confidence in the ability to continue functioning visually. Focus on what vision is left and how it can be used effectively. This will help older persons to maintain positive attitudes.

2. Teach the individual to use visual memory and to continue to rely on visualization for performance of visual tasks.

3. Give assistance in making interpretations and decisions (based on visual imagery) with less immediate visual information available.

4. Emphasize only those visual tasks previously performed by the individual, or those chosen for learning at a point in time. For example, if the person never cared for extensive reading, emphasizing reading as a task would be unrealistic. Let adults set the priorities for visual functioning.

5. Be sure that every effort is made to have a thorough low vision evaluation so that magnification, prescriptive lenses or optical aids can be made available when appropriate.[24]

6. Remember that adaptation to less efficient functioning is slow and far more difficult than learning to perform tasks for the first time. Different patterns of reinforcement will be needed to keep enthusiasm and motivation at a high level. Work with the entire family is imperative.

7. Realize that older persons with usable vision who have considered themselves blind may be the most resistant of all learners in trying to use vision for performance of tasks. They may feel that they have gotten along quite well using "blind

[24]See Chapter V.

techniques," and thus do not understand the value of using vision. They may no longer have the desire to put forth the effort required.

When planning a program, it is always necessary to keep in mind the individual —young, old, or multihandicapped—and allow for his or her special needs. All persons involved must coordinate their assessment and instructional plans in order to be of greatest assistance in improving visual functioning—helping the individual see more and better.

Appendix I

Supplemental Materials for Prescriptive Teaching for Utilization of Low Vision

Materials List Alphabetized, annotated list of supplemental commercial materials for lesson planning.

Source List Codes and full addresses for commercial materials.

Sources of Supply for Magnifiers Names and addresses of companies from which nonprescriptive low vision aids can be purchased.

Key to Use of Sources Section by Section

A. Optical Functions Show awareness of visual stimuli and give indication of receiving visual information. 1-3 months.

B. Optical Functions Develop and strengthen voluntary control of eye movements. Begin to select and discriminate color and shape in concrete objects. 4-12 months.

C. Optical and Perceptual Functions Through exploration and manipulation, discriminate, recognize, and use concrete objects for intentional purposes. 1-3 years.

D. Optical and Perceptual Functions Discriminate and identify shape and detail in pictures of objects, people, and action. 2-4 years.

E. Optical, Perceptual, and Visual Perceptual Functions Remember detail and complex pictures and patterns. Relate single parts to whole. Discriminate figure from background in near-distant perspective. 3-5 years.

F. Optical, Perceptual, and Visual Perceptual Functions Discriminate, identify, and reproduce abstract figures and symbols. 4-5 years.

G. Optical, Perceptual, and Visual Perceptual Functions Discriminate, identify, and perceive relationships in pictures, abstract figures, and symbols. 5-6 years.

H. Visual Perceptual Functions Identify, perceive, and reproduce symbols singly and in combination.

ABC Books Hol F

ABC Book by Helen Federico. BK4335 $2.95[1]
Alphabet with large, bright colors.

ABC Word Book by Richard Scarry. BK2729 $4.95
Hundred of words with colored pictures.

Anno's Alphabet by Mitsumasa Anno BK1873 $8.95
Mind bending images, alphabet book.

The Golden Dictionary by Ogle & T. Thoburn BK4338 $5.95
2500 words with over 3000 color illustrations.

Action Symbols Dlm 319 $2.50 D
36 cards (4-1/2″ × 5-1/2″), with 4 cards picturing each of 9 actions which students imitate with their actions of clapping, stamping, humming, blinking, nodding, jumping, swinging arms, shaking the whole body, and resting. Instructions.

Alike and Not Alike Picture Cards Ide D

Set 1 ID 2681 $3.25
30 4-3/8″ × 5-5/8″ cards. Colored illustrations of animals. Some are same size animals, some different sizes. Instructions.

Set 2 ID 2682 $3.25
42 3-1/8″ × 5-5/8″ cards. Objects pictured differ in height, width, length, or number.

Alike and Unlike Strip Books Did D

Book A-D (5-3/4″ × 3-3/4″) N197-1 $6.95
Introduce basic geometric shapes in various sizes and treatments.

Book E-H (5-3/4″ × 3-3/4″) N197-2 $6.95
Involve greater powers of perception, analysis and synthesis. Book (H) presents matching problems related to fractions and wholes.

Alpha-Blocks Nas SB236J-2006 $10.50 F
40 large letters and 87 connecting rods. Durable letters have no sharp edges. Instruction booklet contains learning aids, teaching aids, cartoons, phonics, and games.

Alpha-Match Gam J701016 $9.95 F
26-1/2″ × 17-1/2″ vinyl game mat; one set of picture cards, one set of alphabet cards, markers, and game instructions. Games for 2 to 4 players require players to complete such

[1]Prices throughout are subject to change without notice.

tasks as matching capital and lower case letters and associating letters with initial sounds or the pictures of words.

The Alphabet (Flip Book) Tre T-440 $3.25 G
Match a manuscript capital letter with its lower case one to make a pair. When correctly paired, an item whose name begins with that letter appears across the back of the page.

Aluminum Geometric Inserts Hol AP 72 $34.50 C
Jumbo Knobs and extra-large pieces. 8 colorful geometric shapes and frames (6″ square) of durable anodized aluminum.

Wooden Insert Tray Set Hol LCW561 $8.50

American Bricks Mil C

590-Piece Set	PS840	$19.80
390-Piece Set	PS835	$13.80
284-Piece Set	PS830	$11.20
186-Piece Set	PS825	$8.40
125-Piece Set	PS820	$5.60

Plastic pieces to put together in different ways by snapping and unsnapping. Various structures can be built.

Animal-Growth Sequential Cards Dlm 467 $3.25 E
6 sequences of 4 cards each, featuring horse, dog, tiger, lion, bear, and cat in 4 stages of development. Information on back of first card in each sequence includes birth weight, litter size, care of young, natural habitat, diet, adult weight, longevity, and common types. 24 5-1/2″ × 6″ cards.

Animal Puzzles Dlm 102 $5.75 E
Full-color photographs of 8 different animals, straight-cut to separate the animals into principal parts. Dog, cat, horse, cow, rooster, deer, squirrel, and chipmunk. 8-1/2″ × 11″ puzzles of heavy, durable board, varnished. Will fit in DLM's Puzzle Tray (Cat. 99).

Antonym Cards Dlm H

English version	234	$2.75
Spanish version	833	$2.75

40 2-1/8″ × 4″ picture cards depicting 20 antonyms. Instructions.

Aquarium Set Chi A

Aquarium only	8N 534	$21.95
Aquarium Kit Only	8N 535	$13.95
Aquarium Kit and Aquarium	8N 536	$34.95

Large, 10-gallon aquarium of deluxe glass. 20″ long. 10-3/4″

wide × 13″ high. Aquarium Kit includes heating unit, pump and filter kit, aquarium thermometer, chlorine neutralizer, food, aquarium guide book.

Association Picture Cards I & II Dlm E

Set I	124	$1.75
Set II	156	$1.75

Each set contains 30 illustrated objects grouped into 6 categories of 5 cards each. The 2-3/4″ × 4-1/2″ cards, made of durable stock, are varnished for easy cleaning. Instructions included.

Association Picture Cards III Dlm 157 $3.50 E

12″ × 4-1/8″ cards designed to be used for practice in association, categorization and verbal expression. Each card contains 4 objects, one of which is in a different category from the others. All 4 objects share at least one characteristic. Learner can identify likenesses and differences.

Bean Bag Activities and Coordination Skills

Kim KIM 7055 C

LP & Manual	$8.95
Bean Bags (Doz.)	$5.95

Children can participate on their own by following the directions in the songs. It is an effective and fun learning experience for students. Bean bags are covered with vinyl.

Bean Bag Toss Game Chi 8A 549 $8.95 B

Masonite board in wood frame. Built-in stand 24″ × 17″ × 17-3/4″. Four bean bags included. Clown is red, white and blue with 3 circular openings numbered 5, 10, and 25.

Beano Bean Bag Set Nas SA7291J-ID4935 $26.50 B

Bean bags are tossed through geometric shape openings. Crossed tubular legs make the 24″ × 36″ target stable. 4 5″ × 5″ bean bags included.

Before-and-After Sequential Cards Dlm 465 $3.25 E

24 colorful 5-1/2″ × 6″ cards. There are 2 cards in each of the 12 before-and-after sequences; for example, flowers growing and flowers in a vase.

Black and White Beaded Alphabet Ide G

Manuscript Capitals	CE 2481	$5.95
Manuscript Lower Case	CE 2482	$5.95

2-1/4″ × 3-1/4″ cards have raised surface created by polished beads.

Body Concept Spirit Masters I & II Dlm D

Set I (Front)	154	$3.50
Composed of 10 front views.		
Set II (Rear, side)	187	$3.50
6 rear and 4 side views.		

Sets of spirit masters reinforce recognition of body parts. Student completes a picture of boy or girl by drawing in the missing part.

Body Parts Dice Game Dlm D

English version	393	$6.25
Spanish version	827	$6.25

Self-correcting game includes an 11″ × 17″ gameboard, 35 plastic chips, one pair of dice and instructions.

Body Position Cards Tea 16-510 $12.95 D

46 stimulus cards (8-1/2″ × 11″) show sitting or standing positions viewed from front, back, side, progress in difficulty from simple bilateral and unilateral moves to crosslateral and complex crossing-the-midline movement. Guide.

Bristle Blocks Mil C

Soft bristles on blocks interlock. Colorful plastic.

Basic Set (32 pieces)	PS 805	$5.80
Intermediate Set (39 pieces)	PS 806	$8.10
Advanced Set (64 pieces)	PS 807	$13.20
Deluxe Set (74 pieces)	PS 808	$16.70

Bunny Ball Chi 8J 693 $6.95 A,B

Furry ball with floppy ears that jingle and feet that are easy to grasp. Both ears and feet are backed with cloth. Soft foam filling inside, washable outer surface.

Busy Blocks Chi 8M 419 $8.95 D

20 large shapes include spheres, cylinders and cubes. Colors include orange, blue, purple, green and white.

Calico Cat Looks Around Chp

Calico Cat Looks Around	1975 (03436-7)	$5.50 C,D,F
Calico Cat discovers geometric shapes.		
Calico Cat's Rainbow	1975 (03437-5)	$5.50
Calico Cat's color adventures.		
Count on Calico Cat	1974 (03435-9)	$5.50
Calico Cat counts and learns more than numbers.		
Letters from Calico Cat	1974 (03519-3)	$5.50
Calico Cat introduces the letters of the alphabet.		

Camouflaged Animal Cards Dlm 551 $7.50 D,E

Each of these 18 plastic-coated cards (11″ × 7-1/4″) presents a full-color photograph of a camouflaged animal in its natural environment. The student's task is to locate, outline, and name the animal on the card. The upper right corner of the photograph shows a small line drawing of the animal to be located. Black-and-white reproductions of photographs on the reverse side show the animals outlined, which allows for self-checking. The animal's name is given. 2 marking pens and 2 wiping cloths included.

Candy Land Mil MB 4700 $5.30 D

Game board, playing pieces and cards. For 2 to 4 players. Child draws a card and moves playing piece to corresponding color or object square on game board.

Car Match-Ups Dlm 374 $3.50 D

Students place the 28 dominolike cards end-to-end to reassemble 27 color photographs. Cards are 8 feet long.

Cardboard Sewing Cards APH 1-0460 $0.05 C

5″ × 5″ white card stock with 11 rows of dots each, 3/8″ from each other horizontally and vertically.

Cardboard Squares for Parquetry Paper Work

APH 1-0462 $0.05 C

7″ × 7″ white card stock, embossed with 25 1″ squares, designed for parquetry paper work.

Categories: Clothing and Household Items

Tea 84-360 $6.95 D,E

100 picture cards (2-1/2″ × 3-1/2″) include 50 clothing cards illustrating many items worn by men, women, and children, and 50 household item cards with examples of furniture from various rooms, appliances, accessories. Guide.

Categories: Foods and Animals Tea 84-350 $6.95 D,E

100 picture cards (2-1/2″ × 3-1/2″) include 50 food cards with examples of fruits, vegetables, meats, desserts, dairy products, and grains, and 50 animal cards with examples of wild and domestic mammals, birds, reptiles, fish, and lower animals. Guide is included.

Categories: Varied Tea 84-370 $5.95 D,E

70 picture cards (2-1/2″ × 3-1/2″) divided into 7 10-card sets: tools, transportation, sports equipment, musical instruments, buildings, communication media, and measuring devices. Guide included.

Chelsea Number Picture Matching Cards

Did N 48-2 $3.25 G

20 reversible cards consisting of 10 pairs of colored pictures accompanied by numerals and number names to pair. Each pair has a sub-dividing cut, making them self-corrective. When matched together cards measure 5-1/4″ × 3-1/4″. Plastic laminated on both sides.

Childcraft Adjustable Chrome Easel

Chi 8C 100 $59.95 C

Large pressed wood panels with light green chalkboard finish measures 27″ wide, 24″ high and is framed with an extra wide chrome plated tubular binding. A matching storage shelf, 24″ × 24″, spans the cross braces, providing space for newsprint, brushes, and paint. Polypropylene paint trough wipes clean with damp cloth or may be removed for washing. Easel stands 48″ high and folds for storage.

Childcraft Animal Puzzles with Knobs

Chi E

Butterfly — 10 pcs.	8Z 142	$10.95
Frog — 5 pcs.	8Z 144	$10.95
Goldfish — 7 pcs.	8Z 143	$10.95
Lobster — 9 pcs.	8Z 149	$10.95
Sea Horse — 5 pcs.	8Z 147	$10.95
Snail — 6 pcs.	8Z 148	$10.95
Tucan — 6 pcs.	8Z 145	$10.95
Turtle — 6 pcs.	8Z 146	$10.95
Complete Set of 8 Puzzles	8Z 150	$79.95

Each picture is silk screened on wood, measuring 14″ × 12″ × 1/2″.

Childcraft Block Play Traffic Signs Chi 8B 430 $9.95 D,G

Authentic replicas of international traffic signs, scaled 1 inch to the foot. Each of the 16 signs is 7″ high on a 2″ round base. Shape and color perceptions are designed to reinforce symbol and word association.

Childcraft Boy & Girl Dolls Chi A,C

Asian Girl and Boy Dolls

Boy	8H 426	$11.50
Girl	8H 427	$13.50

Both dolls are 13″ tall with movable arms, legs, and head. Girl has rooted hair. Clothing included.

Childcraft Giant Block Zoo Animals

Chi 8B 166 $17.95 C

Five extra large zoo animals cut from 1″ plywood and painted on both sides for visual stimulation. Giraffe is 13-1/2″ high. Also included are a camel, a bear, a lion, and an elephant.

Childcraft Hippety Hopscotch Chi 8A 180 $2.95 D

31″ × 77″ portable hopscotch mat rolls up or folds. Plastic playing discs and instructions.

Childcraft Lacing Sneaker Chi 8M 612 $6.95 C

A large wooden shoe helps students learn to lace and tie shoes. Measures 7″ × 3″ × 3-1/2″.

Childcraft Mirrors Chi

Wall Mirror 8D 272 $27.95 A,B

Designed for horizontal or vertical use. Hangs either way by means of self-adhering pads. Measures 16″ × 48″. Construction details are same as the Three-Way Mirror.

Stand-Up Mirror 8D 260 $29.95

16″ × 48″, free-standing mirror allows the child to see full-size, distortion-free image. Aluminum-plated steel legs with non-slip rubber feet.

Plexiglass Mirror 8D 462 $39.95

Unbreakable, 12″ × 48″. Freestanding, durable wooden frame.

Three-Way Mirror 8D 259 $84.95

Hinged mirror panels are shatter-proof, distortion-free. Constructed of non-tear, 2 mil biaxial polyester film, backed by polyurethane foam and stretched on durable 9/16″ aluminum frames. Lightweight. Each panel is 16″ × 48″ with plastic feet. Center panel has self-adhering pads for wall mounting.

Childcraft Number Learner Chi 8X 106 $4.95 G

15 foam squares, representing numbers 1-5, are fitted over the corresponding pegs. Wood base; 4″ × 16″. Self-correcting.

Childcraft Portable Easel and Paint Tote

Chi 8C 103 $17.95 C

The 24″ × 20″ hardboard panels of this easel are hinged at the top, with a cut-off section to serve as the handle, can be set up anywhere. The paint tote houses paints and brushes to facilitate portability.

Childcraft Tactile Letter-Blocks and Board
Chi G

Tactile Letter-Blocks
- Capitals 8L 263 $31.95
- Lower Case 8L 264 $31.95
- Numeral Blocks 8X 250 $12.95

Numerals and letters (approx. hand-size), 5/16″ thick, fit with a 1/8″ protrusion into large, hardwood blocks.

- Tactile Letter-Block Board 8L 265 $21.95

21″ × 24″ board permits letter blocks to be placed in proper alphabetical sequence and locked into position. (Blocks not included)

- Complete Set (Blocks and Board) 8L 435 $94.95

Clock Dial Col MB 8062 $2.75 H

Front has 11-1/2″ diameter clock dial, large numerals and adjustable metal hands. Reverse side displays special clock face, and illustrations of early time pieces.

Clockface with Raised Print and Braille Numbers
APH 1-0312 $12.75 H

5″ in diameter, black plastic face in 7″ frame, with large white numerals. Movable hands attached to regular clock gears so that hour hand follows minute hand in proper sequence whether moved forward or backward.

Cloth Blocks Chi 8J 685 $9.95 A,B

6 blocks, one containing a rattle and another a chime. 3″ across, made of washable fabric and foam.

Clothespin Circle Vit 604 $17.50 C

Pegboard variation that holds pegs forming 4 distinct circles, each a different color. The pegs are easily removed. The 13″ diameter board has 30 holes with pegs supplied in four colors.

Clutch Ball Chi 8J 159 $2.95 A,B

5-1/4″ diameter vinyl washable ball. Bright orange.

Coded Pattern Cards for Beads Tea 82-137 $5.95 D

40 pattern cards (7-3/4″ × 3″), guide. Cards show sequences of 4 to 10 beads each, coded on a grid. Children find numeral, note color column (vertical) and shape column (horizontal) to select each bead. (See Teaching Resources' *Colored Beads* for beads.)

Color and Shape Bingo Tre T-101 $4.95 C

Color and shape recognition game. Includes 8 colors: red,

orange, yellow, brown, green, blue, pink, purple and 4 shapes: triangle, rectangle, circle, square.

Color and Shape Memory Lane Dlm 532 $12.75 D

Four 10-5/8″ × 11-3/8″ game cards which present a 16-part pattern on each side, made up of 4 common shapes (square, circle, rectangle, triangle) in red, yellow, blue, green. Game cards slip into 16-square cardboard grid, 12″ × 12″. 2 to 4 players take turns lifting pairs of markers in an effort to match pairs by color, shape, or both. Instructions.

Color and Shape Set Dlm 530 $38.50 D

Plastic set of 6 strips, 3 cubes and 72 tiles for matching, pairing, counting, ordering, relating and naming. Can also be used with DLM's Sorting Box, Cat. 260.

Color Association Picture Cards Dlm 158 $1.75 D

15 pairs of identical pictures to match. 2-3/4″ × 4-1/2″, in color. Instructions.

Color Beaded Alphabet Cards Ide G

Capitals CE 2488 $9.50
Lower Case CE 2489 $9.50

Large beaded letters on 5″ × 7″ cards. A beaded dot in the lower right hand corner of each card assures the correct position of the letters. Vowels are red, consonants yellow.

Color Cats Tre T-733 $3.95 D

Beginning with the primary colors of red, yellow and blue, the Color Cats teach how to mix and make other colors. Figures range to 27″. Red, yellow, blue, black, white, orange, green, purple, brown, gray are the colors included.

Color Charts (with duplicating masters) Col IR 713 $6.50 D

9 11-1/2″ × 16″ charts that illustrate primary colors in shapes and drawings; 10 masters give follow-up activities. Colors: red, blue, yellow, green, orange, purple, brown, black/white, gray. Guide.

Color Discover Cards Dlm D

English version 306 $3.25
Spanish version 825 $3.25

67 cards in 11 colors, for use in color naming, matching and patterning. One card in each group has the color name printed in large capital letters. 2-1/4″ × 3-1/2″. Instructions.

Color Everywhere Sem SE 1382 $190.00 D

11 lessons introduce colors by using objects of varying shapes and sizes. Musical improvisations. Children's activity sheets and directions for use are part of cassette sound track. 11 full-color film-strips, 11 cassettes, 11 activity sheets in reproducible masters, 8 posters, and guide.

Color, Match, Build Nas SA3686J-1625 $2.55 D

24″ × 24″ heavy-duty vinyl sheet for table or floor; 8 colorful EASY-OFF crayons; multi-colored cardboard shapes; 4 printed project cards; instructions.

Color Matcher Nas SB254J-607 $5.25 D

A 3-dimensional peg matching board with primary colors: red, yellow, and blue, plus black and white. The natural finished board is 14″ × 2-3/4″ × 3/4″ thick, and has 1 set of colors permanently embedded in the board. Matching pegs are 3/4″ × 3″. × 3″.

Color Pattern Board Ide CE 6001 $10.95 C,D

One durable plastic tray with removable lattice; 27 1″ cubes in 9 colors; 6 plastic laminated color pattern cards printed on both sides; 10 templates; 1 number command card; 1 reading template card. Colors: red, yellow, blue, green, orange, purple, black, white, and brown. Children place a matching color cube on corresponding color square. Color card and pattern numbering systems help keep track of child's progress.

Color Recognition Ins 55 $4.95 D

Set of 10 different colored clowns and balloons along with 10 lower case color name cards and 10 initial capital color name cards.

Color/Shape Abacus Chi BX 645 $13.95 C,D

Shapes: circles, squares, triangles, octagons, rectangles, stars and flowers of various colors: red, pink yellow, green, blue, orange — board with 10 stacking pegs for sorting, matrix games and counting activities.

Color Stacking Disks Nas S9238J-170 $8.00 C

9″ high, 10 graduated, hardwood round disks in basic spectrum colors, designed to develop size and color discrimination.

Color Wheels and Parts Edm A

Wheel Dia.	Wheel Only	
6″	71,115	$9.95
9″	71,116	$10.95
12-3/4″	71,117	$11.95

		Complete Motorized Unit: Wheel, Stand, 12 RPM Motor	
6″		71,006	$27.95
9″		71,007	$29.95
12-3/4″		71,008	$32.95

Clear plastic wheels with transparent colors in pie-shaped wedges of yellow, blue, lavender, red, green, and purple. Wheels have 1/4″ center hole.

Colorama Chi 8L 558 $15.95 D

Color and shape recognition game. Set includes board, 108 playing pieces, 1 color die and 1 shape die.

Colored Beads, Cube and Round Tea 82-130 $15.95 C,D

216 hardwood beads: 2 shapes, 3 sizes: 1″, 3/4″, 1/2″. 6 colors, twelve 24″ laces.
(See *Coded Pattern Cards for Beads*, TEA 82-137 and *Pattern Cards for Colored Beads*, Tea 82-135)

Colored Cubes Tea 82-110 $10.95 C,D

120 one-inch hardwood cubes with rounded edges, 6 colors. (See Tea 82-115, *Pattern Cards for One-inch Cubes*, Tea 82-120 *Symmetrical Block Designs, Levels 1 & 2*)

Colored Inch Cube Designs in Perspective
Dlm 111 $4.75 C,D

Use with Colored Inch Cubes, Cat. 110. 32 cards with patterns begin with simple patterns which become more complex with diagonal patterns. 6-1/4″ × 5-1/2″ heavy varnished stock. Instructions.

Colored Inch Cubes Dlm 110 $10.50 C,D

96-piece set of 16 cubes each of red, blue, yellow, green, orange, and purple. Nontoxic colors, cube edges rounded. Various DLM cube designs (Cat. 111, 112, 118, 146) are suggested for use with these cubes.

Colored Inch Designs Dlm 112 $4.50 C,D

24 8-1/2″ × 7-1/2″ heavy varnished stock cards in 6 colors. Designs are formed by matching colors of cube construction with colors of design cards. For use with Colored Inch Cubes, Cat. 110. 3-dimensional patterns. Instructions.

Colors (Mix and Match Puzzles) Tre T-387 $4.95 D

Puzzles match a color with an object identically colored.

Combination Sand and Water Table

Nas Z5020J-H-199-C $118.00 B,C

Constructed of solid hard maple, finished in clear lacquer. 2 legs have ball bearing casters for moving. Covered with birch plywood top. Nonrusting plastic pan with drain plug 23-7/8″ wide × 47-3/4″ long × 24-1/2″ high with top. Pan 6″ deep.

Concept Books Chp D,F

Mr. & Mrs. Opposite 1977 (05941-6) $5.50
Illustrated by Diana Magnuson. A Jack Spratt sort of book to help teach the concept of opposites.

One Unicorn: A Counting Book 1977 (05942-4) $5.50
Illustrated by Arnoldus J. Gruter. A boy goes for a walk and sees unicorns, dragons, thunderbirds, and other fanciful figures.

Over, Under, and All Around 1977 (05943-2) $5.50
Illustrated by Rose-Mary Fudala. A clown and monkey illustrate spatial relationships.

The Parade of Shapes 1976 (05901-7) $5.50
Illustrated by Rose-Mary Fudala. A parade of shapes is forming in the Wonderland of Zin. Readers will see a circle juggler, oval elephants, and other zany characters.

A World of Color 1976 (05902-5) $5.50 D,F
Illustrated by Dan Siculan. Introduces the basic colors. Throughout the book, the reader is asked to pick out various colors.

Each book of 32 pages measures 7-1/4″ × 9-1/2″ and has full-color and 2-color illustrations.

Construction Combination Chi 8M 622 $29.95 B,D

All three sizes are mathematically-related interlocking blocks. Set includes: 15 Structo Bricks; 80 Mini-Construction Cubes; 20 Construction Cubes. Nylon-reinforced plastic.

Constructo Sets APH C,D

Junior (38 pieces) 1-0369 $28.00
Senior (151 pieces) 1-0314 $80.00

Educational toys of various lengths of hard wood (with holes bored at regular intervals) and a quantity of wooden bolts and nuts. Designed to aid in development of muscular coordination, manual dexterity, and construction concepts.

Consumer Sequential Cards Dlm 469 $3.75 D,E

There are 5 sequences of 6 photos each: pay phone, softdrink machine, fast-food restaurant, ice-cream parlor, and gas station.

The contemporary, practical situations are photographed and are particularly motivating to older students. The 30 5-1/2″ × 6″ cards are printed in full color on heavy stock.

Coordination Paddle Nas SB380J-6100 $7.50 B

One side of the 10″ × 11-7/8″ wood paddle is blank for initial activities of hitting the Ping-Pong ball. A 23″ × 29″ 4-color wall target is used with the blank side of the paddle. The other side of the paddle contains 2 concentric circles, 1 on either side of a partition in the center.

Coordination Slide Sem SE 1282 $31.00 A,B

Slide is made with a 3/8″ diameter wire slide mounted in a 9″ diameter vinyl-clad, stamped steel base. The base is counter-weighted to minimize tipping and there are no loose parts to misplace. The unit stands 35″ high.

Counting and Number Concepts Tre D,F

Numeral Sequence 1-30 T-173 $3.95
Missing numerals to fill in and printing guide.

Numbers 1-10 T-131 $3.95
Match numerals to objects and words.

Number Sequence T-133 $3.95
Missing numerals to fill in and guide.

How Many? Level 1 T-139 $3.95
1-10 objects, 7 cards with numeral answers to mark, 5 with objects to cross out.

How Many? Level 2 T-140 $3.95
1-10 objects to count. Space for printing numeral answers.

1-20 Dot to Dot T-148 $3.95
Wild West pictures to complete.

20-40 Dot to Dot T-159 $3.95
Pirate pictures to complete.

Counting Books Hol D,F

Chicken Little Count-to-Ten by Margaret Friskey. BK6015 $2.95

Counting by Helen Federico. BK4337 $2.95
Large colored numbers and animals. 1-10

I Can Count by Dick Bruna. BK5912 $2.50
Big numbers, color illustrations. 1-12

I Can Count More by Dick Bruna. BK5913 $2.50
13-24.

Numbers: A First Counting Book BK2517 $2.95
by R. Allen. Color photos and simple test.

One, Two, Three for Fun by Muriel Stanek. BK2215 $5.75

Everyday play activities.

Rodney Peppe's Puzzle Book by R. Peppe. BK1133 $6.95

Hidden animals and puzzles explore numbers, sizes and shapes.

Counting Box Chi D,F

The Counting Box 8X 377 $24.95

The Color Kit 8X625 $6.95

6″ × 18″ × 3-1/2″ box, 2 number-dot panels and 50 picture plaques (in storage box) of natural-finish wood. Number panels (numerals on one side, dots on other) fit into slotted lid. Painted picture plaques slip through appropriate matching slot. Inside of box partitioned. Add panel to develop color. Includes 20 tiles in storage box.

Creative Blocks Col FP-666 $4.00 A,B

14 colorful building blocks of washable plastic. Includes 4 rectangles, 4 round, 6 wedge shaped blocks and 4 plastic dowels.

Cursive Alphabet Tre T-144 $3.95 H

Guide and writing practice space for upper and lower case letters, numerals. Wipe off.

Cursive Alphabet Wipe Off Bingo Tre T-092 $7.95 G

Players write capital and lower case letter pairs on their cards with crayon or marker, then clean with cloth or tissue. Materials for 36 players.

Cursive Handwriting Development Tea G,H

Cursive Handwriting Development (complete) 20-310 $18.95

Guide, 6 tactile cards, 10 spirit masters, 11 Awards, 1 fine point fiber-tip pen, 1 workbook with folder.

Additional Students Kit — Pkg. of 2 20-315 $18.50

2 workbooks with acetates and 22 Awards.

Reusable worksheets and tactile finger-tracing cards. Large ruling; scale gradually reduced. Color provides cues. Materials for up to 1 year's work.

A. Manuscript-Cursive Transition. 25-worksheets with 7/8″ ruling.

B. Cursive Writing, Intermediate Scale: 30 worksheets with 11/16″ ruling.

C. Cursive Writing, Small Scale: 42 worksheets with standard primary ruling: 3/8″ (1/4″ in lower case)

Deluxe Habitrail Nas SA2132J-5501 $23.75 B,C,D

Housing for classroom pet such as hamster includes Sky Pet House and Cover, Lock Tite Door, No Drip Water Bottle, Big Wheel House, Snap-Top Clean Tray, Litter Plus, Living World Carrot Flavor, Gnaw Stix, Habitrail Connector and Main House.

ACCESSORIES

Starter Habitrail	SA2133J-5502	$13.85
Fun House	SA2134J-5503	$10.75
Sleeping Den	SA2135J-5504	$10.75
Sky Pet House	SA2136J-5505	$2.58
Habitrails	SA2137J-5506	$1.39
Crossroads	SA2138J-5507	$1.29
Vari-Diet—Green	SA2139J-5508	$.59
Vari-Diet—Yellow	SA2140J-5509	$.59
Vari-Diet—Red	SA2141J-5510	$.59
Gnaw Stix	SA2142J-5511	$.79
Litter Plus	SA2143J-5512	$1.00

Depth Block Hol LCW123 $6.75 D

Hardwood pegs of same diameter & 6 graduated lengths are level across top when correctly placed in 2″ × 8″ hardwood block.

Developlay Person Vit 9548 $14.95 D

45″ washable, nontear vinyl laminated human form with mechanical joints to teach functional body movement and self image.

Developmental Motor Skills Kim KIM 9075 C,D

2 LP's & Manual	$13.95
2 Cassettes & Manual	$15.95
Workbooks	ea. $.49

Role playing, dancing animals, marching and rhythm band activities allow for self-expression and stimulate children to develop self-awareness and motor skills. Coordinated with a coloring book to allow teachers to integrate movement experience with language skills and art.

Diameter Block Hol LCW122 $6.75 D

6 pegs of same length and graduated diameters fit into holes of 2″ × 8″ polished hardwood block.

Diameter-Depth Block Hol LCW124 $6.75 D

6 hardwood pegs graduated in both length and diameter are level across top when correctly placed in 2″ × 8″ hardwood block.

Dimensional Puzzle Dlm 271 $5.95 C,D

Each of 12 basic shapes is made up of two pieces. An opening in the top piece fits over the raised surface of the bottom piece. The puzzle pieces and white field are constructed of plastic, surrounded by a yellow frame of heavy cardboard. The puzzle measures 9-3/4″ × 8″.

Discovery Ball Dlm 350 $4.95 C

7 multicolored discs are threaded on a spindle to which the bottom disc is attached. The spindle also contains a metal bell that rolls around as the ball is being assembled. The top disc screws to the spindle to hold the ball together. Self-correcting. Unbreakable ball is of nontoxic plastic.

Directional Mat Tea 16-100 $24.95 F

Canvas-backed vinyl mat (6′8″ × 4′8″) with numbered grids. A child steps out from the central footprint markers to specific points on the mat. Guide presents many open-ended lesson plans.

Directo Tea 81-220 $5.95 E

These 18 sequenced pattern cards (5-1/2″ × 6″) show 2 or 3 familiar objects in increasingly complex relationships to each other and to the viewer. Arranging the 48 cut-outs to replicate the pattern card is the task. A newly revised guide is included.

D'Nealian Handwriting Program Sco G

Handwriting program from Readiness Book through Book Eight. Emphasis is placed on the formation, size, slant, and rhythm learned in the 1st and 2nd grade and to make the transition in to cursive more flowing. Slant, spacing, and shape are uniform throughout the program. Size changes only once —at 4th grade. D'Nealian has provisions for special populations. Notes in the Teacher's Editions help work with the left-handed, ambidextrous, immature in learning and motor coordination, mirror-oriented, color blind, and learning disabled.

Readiness Level	Pupils' Text $1.44	Teacher's Edition $2.79
Book 1	Pupils' Text $2.13	Teacher's Edition $3.54
Books 2-8	Pupils' Texts, each $2.13	Teacher's Editions, each $3.18

Dolch Cards Col H

Picture Word Cards GA-2200 $2.25

95 Commonest Nouns, compiled by Dr. Dolch, from beginning reading books. One side: picture and word. Other side: only word.

Group-Size Picture Word Cards GA-2209 $3.85

Revised Dolch list of 95 Commonest Nouns on 8″ × 3″ cards. Jumbo type.

Dolch Word Cards APH 1-0356 $5.75 H

Consists of the Dolch Basic Sight Words which make up 75% of the primer words, 65% of first and second readers and 50% of all other school books. They include the most commonly used pronouns, adjectives, adverbs, prepositions, conjunctions, and common verbs which must be recognized by sight before a child can read with interest and confidence. The cards are 3-1/2″ × 2″ and type is 18 point.

Dot-to-Dot Mil MB 7702 $5.00 G

24 duplicating masters. Child works to draw letters from point to point to make complete picture. Self-correcting. K-2. Non-reading.

Dot-to-Dot Pattern Sheets Dlm 143 $7.50 C

Package of 400 sheets of 8-1/2″ × 11″ paper has 20 different designs for game of connecting consecutive dots by straight lines to form a picture or design.

Dots and Colors Chi 8X 563 $14.95 D

A bingo-type game with dots and large colored circles on tiles. Child matches tiles to dots and colors shown on the wooden dice, which he tosses.

Double Hanging Capiz Chimes Abb 03658 $4.00 A

18″ long clusters of translucent capiz shell hang from a capiz shell canopy top.

Dual Panel Buzzer/Light Message Unit

Dlm 510 $19.50 B,E

Student operates top-mounted switches to produce 3 different modes of signals: sound to sound, light to light, sound to light. These are selected by the teacher through a concealed 3-position switch. The switches have been positioned to allow the student's palm to rest on the lower portion of the board. This stable base helps students who need more support or spatial orientation guidance. The buzzer device is tuned to provide maximum vibrations which can be felt on the panel top. 2 size "D" batteries (not included) are required. The unit comes with instructions.

Dubnoff School Program 1 Tea D,G,H

Authors: Belle Dubnoff, Irene Chambers & Florence Schaefer

Program 1 — Level 1 21-110 $19.75

Horizontal, vertical, circular, diagonal, and intersecting lines; basic geometric shapes. Guide, 112-p. workbooks (3), with acetates, crayons, Good Work Awards.

Level 1 Additional Workbooks (3)	21-115	$16.25
Program 1 — Level 2	21-120	$19.75

Combinations of strokes and strokes with directional changes. Guide, 3 120-p. workbooks with acetates, crayons, and Good Work Awards.

Level 2 Additional Workbooks (3)	21-125	$16.25
Program 1 — Level 3	21-130	$21.50

Strokes used in upper-&-lower-case letters and in numerals; manuscript writing. Supplementary section for transition to cursive writing.

Level 3 Additional Student Workbooks (3)	21-135	$16.25
Teacher's Specimen Set	21-100	$23.95

Guide and one 112-page workbook for each level, with acetates, crayons, and felt markers.

ETA Best Vests Vit C

Buttons	9A	$7.95
Raincoat Snaps	10A	$7.95
Zipper	11A	$7.95
Bows	12A	$7.95
Snaps	15A	$7.95
Buckles	16A	$7.95
Complete Set of 6 Vests	13A	$47.70

Heavy weight, denim vests with large fasteners are washable. Size is adjustable for sizes to fit either children or teens.

ETA Bolt Tight Sem 3650 $6.50 C

8 2″ diameter wood wheels, metal screwdriver, wrench, bolts, nuts, and washers to help develop coordination.

The ETA Learning to Write Kit Vit F,G

Acetate Overlays (6)	5090	$2.00
Directional Letter Guide Cards (12)	2348C	$2.40
The *Eta Learning to Write Kit* (Complete)	2349	$59.95
E-Z Grip Pencil Holders (25)	2348K	$3.50
Kinesthetic Tracing Alphabet	6132	$19.95
Letter Tracing Stencils	2348D	$4.25
Manuscript Letters and Numerals Spirit Masters	2348J	$3.95
Pencil Control Tracing Charts,	2348A	$11.50
Tactile Sandpaper Letters	2348H	$9.95
Writing Exercise Books (6)	2348F	$4.25

Suggestions for using sequenced exercises in Teacher's Manual.

ETA Phonic Couplets Vit 2708 $3.75 H

20 phonic words on cards divided into two (picture/word) by a curved cut which makes the matching exercise self-corrective.

ETA Pre-Number Kit Vit 4885 Kit, $58.00 D

A. Shape Sorting Board	4877	$8.95
B. Jigsaw Inset Numbers	4881	$7.50
C. Handy Tray	3961	3/$11.95
D. Plastic Spools	4882	$8.30
E. Play Shapes (30 pieces)	4883	$3.10
F. Counting Buttons with laces (100/4 colors)	4884	$7.25
G. Tactile Color Shape Inset Boards	4876	$9.50

ETA Size Comparison Set Vit J1 Set, $6.50 D

4 identical girls, graduated in size, are to be matched and compared. Self-standing. Largest is 10″.

ETA Wood Tool Working Set Vit Y16 $12.95 C

5 sizes of screws to be assembled with rings on a base board. Wooden screw driver included. For use with Kindergarten and handicapped children.

Fun Activities for Fine Motor Skills Kim KIM 9076 C

LP & Manual	$8.95
Cassette & Manual	$9.95

Activities designed to help children focus on fine motor skills: eyes, tongue, basic clapping, and finger play.

Fun Boxes Col BS 660PS ea. $24.95 F,G,H

Each of 6 Edu-Card Fun Box Games packaged in Perma-Sta Box tray. Assortment and rack in metal storage unit.

Games include: number recognition game,
animal spelling game,
number fishing game,
+ and –, school bus game,
letter recognition game, and a
find and read game.

Fun with Capital and Lower Case Letters

Col 2204 $9.95 G

Sequenced alphabet activities. Youngsters recognize letter forms, learn capital and lower case as same letter. Reference chart, self-checking puzzles, self-correcting letter matching wheels, worksheets.

Functional Signs Dlm 190 $7.95 D,G

44 realistically depicted signs, printed on both sides of 22 pieces

of heavy board stock. Three sizes: 18″ × 5″, 12″ × 5″, and 11″ × 11″. Instructions.

Functional Signs Match-Ups Dlm 239 $4.50 D,G
8 master game cards, 58 matching cards and instructions.

Game Kits Shm F
Readiness (K-3) 909 $4.95
Letter Recognition 925 $4.95
K-2. Capital and lower case manuscript letters.
Following Directions 911 $4.95
Grades 1-4. Gameboards to help students read carefully.

Gear Wheels Vit 3063 $14.50 C
Take apart toy, constructed of wood and finished in safe, bright primary colors. 25 × 25 × 7 cm.

Geo-D-Stix Chi 8M 332 $8.95 D
Color-coded, vinyl sticks, in various lengths, fit into flexible plastic connectors. For forming structures, including the 3 basic polyhedrons and other major geometric shapes. 350 pieces. Instructions.

Geometric Figures and Solids Chi 8X 231 $17.00 C,D
17 plane figures of fiberboard. 22 solid geometric figures of hardwood, sanded and smoothed. Pieces average about 2″ long. Plastic storage container.

Graduated Stacking Tree Hol LCW120 $6.95 B
Hardwood blocks in graduated lengths stack on 5-1/2″ high peg. All edges are rounded for safety. Longest block is 8″.

Great Shapes Tea 16-200 $12.95 D
9 mats printed with 3 shapes in 3 colors and 3 sizes. Guide includes a variety of flexible and open-ended activities.

Grip Ball Chi 8J 652 $3.50 A
4″ diameter easy hold grip. Bright pink. Washable vinyl.

Handwriting Grades 1-4 Shm G
Manuscript Letters and Numerals HW01 $3.95
Cursive Letters and Numerals HW02 $3.95
Cursive Letter Connections HW03 $3.95
Reproducible self-directing practice exercise with drill space covering complete spectrum of alphabet and 10 digits.

Hayes Reading Workbooks Shm G,H

Giant ABC Workbook H-R122 $4.25
Large block-style type for capital and lower case letters. Illus. Cut-and-paste. Color dictionary.

Non-Reading Activities H-R123 $3.50
Pre-Primer visual perception exercises for recognition and discrimination skills.

Pre-Primer Readiness H-R137 $2.50
To teach colors, following directions, coordination, shapes.

Seatwork for Beginners H-R117 $3.95
Large pictures, color chart, color test and exercises for alphabet & number recognition.

Reading for Beginners H-R116 $3.95
Illustrated exercises graduate into pre-primer and primer levels. Short stories.

Reading and Arithmetic H-R131 $3.95
Exercises to provide training in use of small muscles, eye-hand coordination, sight vocabulary.

For use with Spirit or Liquid Machines

Hidden Letters Hol REF148 $9.95 G
Child slips card into write-on, wipe-off holder and circles or traces 20 upper and lower case letters hidden in picture. Each of 24 illustrated cards deals with one letter of the alphabet (X and Y excluded). 4 reusable plastic cardholders.

Homonym Cards—Homographs Dlm 232 $2.75 H
40 colored 2-1/8″ × 4″ picture cards teach 20 basic homonyms. Instructions.

Human Body Parts Nas SA782J $5.35 C
5 large, 16″ figures that illustrate relationships of body parts and clothing. Parts are pieced together to form figure. Multi-ethnic figures represent clothed bodies for summer and winter seasons.

I Can Read Signs Mbn U 104 $34.50 F,G,H
4 silent filmstrips with manual. Letters, words and numbers as seen by children in everyday life. Produced by Urban Media Materials. Includes "I Can Read Signs with Numbers".

In-Out Block Cage Hol LCD54 $9.95 B
Durable wooden cage is 4″ high, 5-1/2″ in diameter. Includes 12 colorful blocks.

In and Out Board APH 1-0328 $7.75 C

Related Manual APH 1-0225 $3.65

Board contains 3 sizes of sink stoppers, attached with cords of varying lengths. Cushions are fastened to bottom of corners to prevent scratching work surface and to avoid slipping. 2 sets of 3 round nests in the base accommodate each of the 3 sizes of stoppers. The terms "in" and "out" are thus demonstrated to the learner while manipulation is pursued.

Independent Living Sequential Cards

Dlm 470 $3.75 E

The 30 cards 5-1/2″ × 6″ are divided into 5 sequences of 6 cards each: washing clothes, vacuuming, mopping the floor, dusting, and sweeping.

Infant Fitting Board Vit C

Infant Fitting Board I Y15 $16.45

Circles and semi circles in varying diameters and 4 colors. The 20 pieces are in 8 different diameters. Overall size is 20 × 20 cm.

Infant Fitting Board II Y19 $16.50

Includes squares, rectangles and triangles in three colors and in varying sizes. 14 shapes in the set. Overall size is 20 × 20 cm.

Infant Fitting Board III Y20 $16.55

Features colorful composite pieces of rectangles, squares, and triangles and a trapezoid. 22 pieces. Overall size is 20 × 20 cm.

International Signs and Symbols Dlm 448 $4.75 D,G

15 heavy stock cards 7″ × 7″, with identification of each sign printed on reverse side. Includes bike trail, no bikes, no right turn, no entry, parking, no parking, hospital, telephone, first aid, information, rail transit, bus, restroom/men, restroom/women, and food services. May be used in conjunction with Functional Signs and Survival Signs to extend recognition and comparison of traditional and international signs.

Jingle-Rattle-Clunk Blocks Chi 8J 485 $3.25 A

Each block makes a different sound: a jingle bell, a wooden bead, a rattle. The finger holes provide easy holding and probing; the rounded edges let the blocks wobble and roll.

Letter and Number Panels Nas

Capitals — A to Z Panel SA7809-J-2305 $4.25

Lower Case — A to Z Panel SA7810-J-2306 $4.25

Numbers — 1 to 10 Panel SA7811-J-2307 $2.50

Cut-outs are 2″ in height and fit into 11-1/2″ squares which are 3/16″ thick crepe foam rubber in two colors, blue and yellow.

Letter-Matching Strip Books Tea 81-135 $10.95

8 books 5-1/2″ × 8-1/2″ present letters that have similar configurations and that are most commonly confused. Books 1-3 require matching single letters; books 4-8 present letter pairs in combinations of 2 colors. 1 guide for all 8 books is included.

Lincoln Logs Mil B

Explorer Set (128 pieces)	PS 857	$10.00
Frontiersman Set (154 pieces)	PS 858	$12.80
Lincoln Logs Double L Ranch (310 pieces)	PS 867	$19.00
Lincoln Logs Frontier Town (430 pieces)	PS 868	$25.60
Pioneer Set (74 pieces)	PS 855	$6.00
Scout Set (90 pieces)	PS 856	$7.60

Miniature logs are made of real wood, 3/4″ diameter and are stained and waxed. Includes logs, roof boards, gables and chimneys.

Lite Brite Dlm 130 $14.50 B,C

Transparent colored pegs are placed on a black paper background design which shows the color pegs to use. A light within the box shines. The set includes 369 pegs, 15 designs to copy, and 9 blanks for students to create their own designs. Instructions are included.

Little Canisters Dlm 335 $5.50 C

6 plastic canisters, brightly colored with white lids. Placing and removing lids, nesting, and stacking are some of the possible activities.

Little Fisherman Mil PS 403 $5.60 C

Rod and reel are 17-5/8″ long and made of smooth wood and plastic. The bait adheres to the three fish and the hook.

Living Parts and Wholes Tea 84-315 $5.25 E

A set of 36 (3″ × 4″) photo cards illustrates parts and wholes of familiar animals and a person. Learners match parts to the whole and can compare corresponding parts of different animals. Guide suggests a variety of activities.

Locking Shapes Nas SB579J 1426 $14.95 D

Flexible 3″ × 6″ locking bars are made of durable plastic. Color-keyed shapes only lock in place when matched. 42 shapes on 21 bars.

Logic Cards Dlm 241 $2.50 E

30 (2-2/3″ × 4-1/2″) cards with pictures showing various circumstances in which teenagers might be involved. The student can create brief accounts of familiar situations or 1 long and involved story. Teaching suggestions.

Look Alikes Tea 81-150 $10.95 D

12 decks of cards. Each deck consists of 12 pairs of designs. The basic design within each deck is the same, with only very minor differences in position or orientation of detail. 6 of the decks present pictures of common objects; 6 present abstract designs and patterns. Guide.

Look and Do Cards Tre C,D

Body Awareness T-322 $3.50

Cards invite youngsters to join in a variety of activities.

Body Movement T-321 $3.50

Cards illustrate common movement activities for students to follow.

Body Parts T-323 $3.50

Yellow cuckoo bird points out major body parts and invites youngsters to join in "Look 'n Do" activities using these parts.

Following Directions T-324 $3.50

Body movement activities through listening and following directions.

Look and Learn Tea D,F,G,H

Look and Learn (complete 31-210 $18.95

2 spiral-bound stimulus books for teacher use, 1 112 p. workbook, one acetate protector, guide. Pictures, geometric shapes, numerals, lower case letters.

Additional Student Workbooks (pkg. of 3) 31-215 $11.95

Stimulus Book 1: pictures, geometric shapes, numerals, letters (lower case)

Stimulus Book 2: presents words grouped into 6 categories: initial letter change, final letter change, transposition of initial and final letters, medial letter change, word endings, internal order.

Lunar Balls Non-Toxic Foam Balls Chi A

Package of 6 4″ diameter balls	8A 595	$7.95
1 7″ diameter ball	8A 596	$4.50

Magnet Chalk Board C

Chalk Board	8L 483	$14.95

Green chalk board that attracts metals as well as drawings. 24″ × 36″, with metal frame. Includes stands for table and floor.

Magnetic Letters and Numbers F,G

Capitals	8L 505	$5.95
Lower Case	8L 509	$6.95
Numerals	8X 379	$4.95

Letters and numbers of plastic, with built-in magnets. Capital 2″ high. Number set includes basic arithmetic signs.

Moist Clay Chi C

5 lbs.	8C 210	$2.50
50 lbs.	8C 211	$9.95

Evenly colored, smoothly textured and self setting.

Monster Lacing Cards Dlm 552 $6.50 C

The 6 cardboard lacing cards measure 8″ × 8″ and have a varying number of 1/4″ holes punched throughout the cards. 6 54″ laces in assorted colors and instructions are boxed with the cards.

Montessori Number Match Kit Chi 8X 620 $31.95 F

7″ × 10-3/8″ wooden boards, 32 blocks. Children count colored objects, recognize groupings, match number of dots on each square to objects pictured and select corresponding numeral.

More and Less Books Maf D

Book 1	9F-DWR27710	$15.00
Book 2	9F-DWR30410	$15.00

Reading age approximately 6 and up. 26 pages, size 4″ × 5-3/4″. Laminated cover. Full color. Each group of 3 illustrations is arranged to show an ascending and descending relationship in terms of size, quantity or distance. Facing pages present groups of comparative words, opposite in meaning, e.g.: 'big, bigger, biggest'; 'small, smaller, smallest'.

Motor Expressive Language Dlm D

Set I	159	$1.75
Set II	160	$1.75

Each set contains 30 picture cards in color on varnished stock. Pictures are to be selected by child for associative relationships. 2-3/4″ × 4-1/2″ cards.

Multi-Form Frames Ide CE 6028 $12.25 C

6 frames, 8″ × 8″, contain complex geometric shapes and involve a higher degree of perception.

Multilink Chi F,G

100 cubes	8M 533	$9.95
500 cubes	8M 630	$44.95
Counting Board	8X 669	$12.95
Number Tack	8X 667	$13.95
Pegboard & Grid Cards	8X 719	$5.95
Pattern Boards	8X 668	$8.95
Snap-On Markers	8X 670	$2.95
Teacher's Manual	8K 900	$1.50

2 cm. cubes snap together on 6 sides to teach one-to-one correspondence, ordinal and cardinal number, fractions, area, volume, symmetry. Removable number panels of Counting Board — ordinal and cardinal number. Number Track forms from 1-100 in interlocking increments of 10. Clear plastic pegboard and 6 grid cards. Pattern Boards show differences between odd and even numbers.

Noun Puzzles—Rompecabezas De Nombres

Dlm H

48 Noun Puzzles. Top section of puzzle shows object, bottom section, its printed name. Sections interlock only if they belong together. Content of both versions corresponds to facilitate transfer of languages for bilingual students. 24 double-sided, 3″ × 4-1/3″ cards. Instructions.

Number and Picture Matching Strip Book

Did N 212 $2.75 F,G

Values from 1-10 are represented by groups of familiar objects, with corresponding numeral elsewhere in book. The child must count objects and find the related number symbol. Background must match the band of color under the corresponding picture group. Page size 7″ × 3″.

Number Bingo Tre T-102 $4.95 F

Numerals 1-20 in large, easy-to-read print for a numeral recognition game.

Number Line Device APH 1-0348 $33.00 H

The APH Number Line Device bridges a gap between the concrete and the abstract. Consists of 3 parts with the following physical dimensions:

(1) A base, 24-1/4″ × 6-1/2″ × 1-3/4″, with room for 2

line segments to be used simultaneously and work storage area for the plastic solids.

(2) 10 interchangeable vinyl line segments, 20-3/4″ × 1-1/2″, white with a black raised line and large raised black dots at intervals indicated by both braille and print numerals.

(3) 40 plastic cylinders, 1″ × 1/4″ in diameter, which serve as pegs and/or interlocking bars.

Included is a booklet which explains in detail the manipulation and uses of the device.

Number Puzzles Tea F,G,H

Level 1 83-710 $7.95

10 2-part wooden puzzles, each 3-1/8″ × 5-1/8″. Boxed. Guide. Numerals and set configurations from 1-10.

Level 2 83-720 $8.95

10 3-part wooden puzzles. Each 1-5/8″ × 6-1/8″. Boxed. Guide. Numerals, set configurations, and number words from 1-10.

Number Recognition and Conservation

Tea 83-120 $7.95 F,G

3 decks of cards, 30 cards each and strip book. First deck matches quantities to numerals 2, 3, 4, and 5. The other 2 decks present numerals and arrangements of bars, dots, squares, pie slices, familiar objects in sets of 1-10. The strip book matches numerals 1-10 with equivalent sets. Instructions.

Numberland/Counting Game ABC 379-343 $5.50 F,G

Playing board, counting cards, 3-D plastic numbers, 4 colored pawns. Introduction to numbers through sight and touch. For 2, 3, or 4 players.

Peg-A-Circle APH 1-0855 $10.00 C

Related Manual APH 7-0225 $3.65

The square board contains 16 nests. The 16 nests form a circle in which the 16 pegs are placed.

Cushions are fastened to the bottom of each corner to prevent scarring of desk or table surfaces and to eliminate slipping on smooth surfaces.

Related Manual: Barraga N., Dorward, B., & Ford, P. *Aids for Teaching Basic Concepts of Sensory Development.* c. 1976. $3.65

Peg Kit APH 1-0342 $15.00 C

Each kit contains:

1 wooden work and storage box, 8-1/4″ × 5-1/2″ × 2-7/8″
6 inset frames
3 pegs, 1-7/8″
6 1″ pegs

The pegs in the kit vary according to size, color, and are tactually different. There are 2 sizes of pegs. The colors are red, yellow and blue. Each peg has either 1, 2, or 3 grooves. 6 black inset frames with holes of varying sizes and number can be placed in the black wooden box; this provides structure for matching, sorting and manipulating the pegs. The kit was so designed that no two features can be matched simultaneously.

Peg Quoits Chi 8A 515 $8.50 B

For use indoors or out, the board is 17-3/4″ square, with 5 posts, 1 in center and 1 in each corner. 4 unbreakable plastic quoits are included.

Peg Sorting Board Chi 8M 398 $12.95 C

Natural wood board with 2 playing sides and an assortment of 25 pegs in 5 lengths and 5 different colors: blue, yellow, green, red, and black. Board size is 5-3/4″ × 5-3/4″.

Pegboard Dlm 128 $1.75 D

6″ × 6″ pegboard, designed for individual use, has 10 rows of 10 holes each. Sturdy plastic.

Pegs Dlm 129 $3.75 D

240 plastic pegs in box, 40 each of 6 basic colors.

Pegboard Designs Dlm 150 $11.75 D

152 cards printed with patterns, divided into 8 categories by order of complexity. Students duplicate patterns with pegs and pegboard. Instructions integrate chalkboard and seatwork exercises. Box has dividers.

Peg-It Boards Ide CE 6078 $18.95 F

Each 4″ × 8″ Tactilmat board contains a numeral with corresponding holes for inserting pegs. Easy grip pegs included. To reinforce number concepts, 1 through 10. Instructions in English and Spanish.

Peglace Board Dlm 252 $16.95 A

24″ × 24″ Masonite pegboard and 6 72″ colored laces with plastic-coated tips for partners to create designs or duplicate patterns. One student pushes lace through hole while another student pulls lace through and returns it. Pegboard mounted on legs.

Penlight and Flashlight APH 1-0839 $26.50 A,B

Includes flashlight, 5 translucent color discs: white, yellow, blue, red, green. 4 transparent color discs: yellow, red, blue, green. Also 1 penlight with 5 translucent color caps: white, yellow, blue, green. Batteries not included.

Perception Puzzle—Chickens Dlm 267 $4.25 D

Puzzle, 10-1/2″ × 3-1/4″; 5 chickens in different positions, related to positions of letters. Each piece has small knob to aid in handling and placement.

Perception Puzzle—Locks and Keys

Dlm 434 $7.00 E

7 colored locks and keys (red, orange, yellow, green, purple, gray, blue) differing in configuration and orientation must be fitted together and placed in corresponding puzzle-board depression or on table. Parts can be traced to make silhouette. Each piece 4″ × 2-1/2″, has small knob and fits into 11″ × 8″ field.

Perception Puzzle—Pigs Dlm 266 $4.25 D

5 pigs, graduated in size. Each has a small knob to aid in handling and placement. 10-1/2″ × 3-1/4″ puzzle colorful, of wood.

Perception Task Cards Mil MB 7915 $4.50 G,H

Peg Patterns, Make-A-Shape, Letter Forms and Make-A-Word. Task cards format. Self-checking. Suggestions.

Percepto Mats Tea 50-199 $19.95 D

Mat 1 — square and circle
Mat 2 — square and triangle
Mat 3 — overlapping square and triangle
Mat 4 — overlapping triangle, circle, and square.

Set of 4 mats, measuring 40 × 49 in., is printed with large geometric figures. Guide.

Perceptual Bingo Tea D

Perceptual Bingo — (Erie Part 2) 35-520 $24.75

6 booklets of bingo sheets (2 each of books A, B, C), set of call cards in looseleaf binder, guide.

Additional Bingo Books — Pkg. of 6 35-525 $8.50

Perceptual Concept Series Col D

Figure/Ground	IR 630	$5.95
Identifying Relationships	IR 631	$5.95
Positions in Space	IR 628	$5.95
Seriation (Sequences)	IR 632	$5.95
Shape Constancy	IR 629	$5.95

8 (11-1/2″ × 16″) charts, 16 duplicating masters, and teacher's notes in each set.

Pickpairs Mil MB 7556 $4.50 D

54 pairs of colored 2″ × 2″ object cards. For small group play.

Picture Clues Hol REF57 $11.95 D

Simple picture cards are slipped one at a time into flip-page cardholder. Child identifies picture from gradually revealed information, through progressively larger holes. Entire picture is revealed on last page. 35 picture cards.

Picture Lacing Boards Dlm 203 $6.25 C

6 photographs of familiar items: clockface, telephone, football, typewriter, guitar, and egg. Mounted on heavy board. Vary in complexity with the position of the holes. 6 54″ colored laces and full instructions included.

Pipe Put-Togethers Chi B

Set of 60	8M 575	$49.95
Set of 120	8M 576	$89.95

Large pipes and fittings. Durable plastic construction permits their use in water.

Plain Inch Cube Designs in Perspective

Dlm 118 $3.75 C,D

Set of 36 8-3/4″ × 7-1/2″ cards printed on heavy stock. Students must discern perspective of pictures of stacked blocks without the aid of alternating colors. Instructions.

Plain Inch Cubes Dlm 117 $4.50 C,D

30 finished hardwood cubes with rounded edges. For building designs in perspective.

Plastic Cube Design Cards Dlm 512 $4.75 C

32 patterns on 5-1/2″ × 6-1/4″ cards of heavy varnished stock. Instructions. For use with Plastic Cubes. See Plastic Cubes, Dlm #511 ($9.00).

Plastic Cube Design Cards in Perspective

Dlm 513 $4.75 C,D

For use with Plastic Cubes. 24 7-1/2″ × 8-11/16″ cards. Students match card and cube colors. Instructions.

Plastic Cubes Dlm 511 $9.00 C

96 3-centimeter cubes in 6 nontoxic colors with rounded edges. rounded edges.

Plastic Princess Phone Chi 8H $1.95 C

Realistically sized in durable plastic and designed to encourage communication skills. This push button model rings as each button is depressed.

Play 'N Fit Nas SA862J-2106 $6.75 C,D

Lotto game and puzzle. 64 pictorial shapes fit into 4 8″ frame squares. All are 3/16″ thick, in 4 bright colors. Instructions are included for a puzzle for older children, a solitaire game, and directions for the visually handicapped. There are 64 call cards.

Play Scenes Lotto Mil MB 7929 $3.75 D

Lotto cards present photographs of children at play in familiar settings. Colored photos repeated on individual matching cards.

Position Pairs Tea 81-180 $8.95 D

6 decks of cards at 6 levels of difficulty. Each consists of 12 identical pairs of cards showing various arrangements of vertical and horizontal lines and/or circles in solid or outline form. Children sort and match the cards. Small group games suggested in guide.

Pound A Ball Nas SA3605J-77430 $7.25 B

Bench (9-3/4″ × 4″ × 4″), wood hammer, 4 balls, 1 each of red, blue, yellow, green. Balls are pounded into holes on top of bench, disappear, roll through bench, reappear, and rest in trough on side of bench. Teaches object permanence.

Pounding Bench Chi 8M 220 $3.95 B

Bench is 12-1/2″ × 6-3/4″ × 5-1/2″. Pegs fit tightly into holes of bench to challenge child and afford an emotional outlet as well as provide eye-hand coordination development.

Pre-Dance Activities Nas C

12″ LP record SA3468J-LPED130 $7.95

The Hokey Pokey Album SA1791J-R33 $5.95

12″ LP album. Includes the Bunny Hop, Skip to My Lou, Pop Goes the Weasel and Oh, Susannah. Instructions.

Do the Hokey Pokey SA7386J-8073 $2.60

LP Record. Includes Bunny Hop; Mexican Hat Dance; 'Round the Mulberry Bush; This Old Man; Ten Little Indians; Blue Tail Fly; Farmer in the Dell; 4 more. 12″.

Pre-Reading Visual Discriminating Boards

Maf 9F-DWR273 $14.50 G

2 separated boxes, each containing 2 boards (12″ × 5-3/4″) and 28 loose matching cards.

Pre-Writing Design Cards Dlm 146 $3.95 G

22 design cards placing Colored Inch Cubes (Cat. 110-not included) on cards for practice in seeing small, tall and long

areas and space in between. Designs form words and sentences, which are printed on backs of cards in manuscript and cursive. Cards also show red and green lines in same position as DLM's Color-Cued Control Paper, Cat. #108, which is not included. 12″ × 4-1/8″ cards; 10 blank cards.

Primary Writing Cards (Wipe Off) Tre T-166 $3.95 G
12 primary-lined writing cards — reusable printing slates.

Pull Discs Chi 8M 546 $7.95 C
5 wooden circles stack from smallest to largest inside tiered wooden block. Each circle has from 1 to 5 holes to indicate placement.

Puzzle Form-Board Kit APH 1-0372 $27.00 E
The Puzzle Form-Board Kit consists of: 5 frames, 4″ × 6″ × 1/2″, each with a different intaglio cutout section in the shape of a circle, a square, a triangle, a diamond, or a rectangle.
15 sets of shaped pieces (3 sets for each of the above shapes), which fit into the frames. Each shape is divided variously into 1, 2, 3 (and, in one case, 4) puzzle pieces. The 5 sets of shapes are painted in different colors—the circle, red; the square, blue; the triangle, yellow; the diamond, brown; and the rectangle, green. The 3 sets for each shape are painted in varying tones of the same color. While all of the pieces are smooth on the back, 3 different textures are provided for each set of shapes.

Pyramid Rings/Pyramid Squares Chi C
Rings 8J 694 $3.95
Squares 8J 695 $3.95
Stacked on the center ring, the 14 varied sized plastic rings and squares form easy to assemble multicolored 9″ pyramids. Unbreakable and completely washable.

Reaction Cards Dlm 240 $2.75 E
Each situation is presented on 4 cards: 1 base card with a problem situation the 3 possible reaction, or solution, cards. Teaching suggestions accompany the 24 colorful 5-1/2″ × 6″ cards.

Reading Readiness Tre D,G
A-Z Dot to Dot T-147 $3.95
Complete occupations pictures by connecting capital letters. letters.

a-z Dot to Dot T-157 $3.95
Complete circus pictures by connecting lower case letters.

Colors and Shapes T-132 $3.95
Match shapes, colors; colors, to words.

The Alphabet T-130 $3.95
Match capitals-to-lower-case letters.

Reels and Wheels Dlm 351 $5.50 C
The 3 reels are threaded rods of different colors. The wheels are shapes that are screwed in a clockwise direction on the reels. Each of the wheel shapes will fit only 1 of the reels. The 18 brightly colored wheel shapes are circles, squares, and triangles. They are of nontoxic plastic. Instructions are included.

Relationships Chi 8X 679 $12.95 D
Set includes 54 plastic pieces, 9-section, 6″ square plastic sorting tray, 33 sequenced activity cards and teacher's guide. The characteristics of shape, size and color are in 3's to teach seriation rather than just comparison.

Ring Fling Chi CE 4936 $14.50 B
11-1/2″ diameter base with a 12″ high post provides the target for ring toss. 3 large plastic rings, 14″ diameter, are included.

Rock-A-Stack Col FP627 $2.70 A
6 fluorescent plastic rings fit over cone in sequence of spectrum and size. Rocker base, washable, squeezable. 7-3/4″ high, base 4″ square.

Rolling Phonics Ins 1313 $7.50 H
Students build spelling and vocabulary skills using 10 playing cubes containing consonants, blends, and letter combinations. All 1″ plastic cubes are engraved, nontoxic, and durable. A guide gives instructions for the teacher.

Rolling Pin Chi 8M 547 $5.95 B
Pin and disc are wooden. Cutout round disc is moved up or down the stick by passing over different notched protrusions.

Rolling Reader Ins 1311 $7.50 H
7 word cubes can be combined to form sentences with every roll. Nouns, verbs, adjectives and adverbs are used to form sentences. Comes with sand timer. All 1″ plastic cubes are engraved, nontoxic and durable. A guide lists games for minimal supervision.

Round Shape Box Vit 4313 $6.75 C
8 shapes, each in a different color. Each piece can be "posted" only through its own hole in the removable lid. Container is red and lid is white.

Rubber Differences Puzzles Chi C

Birds—9 pcs.	8Z 651	$3.25
Cars 'n Trucks—12 pcs.	8Z 653	$3.25
Fish—12 pcs.	8Z 650	$3.25
Kids (children)—18 pcs.	8Z 579	$3.25
Ships—11 pcs.	8Z 649	$3.25
Wild Horses—9 pcs.	8Z 652	$3.25
Set	8Z 654	$18.95

Close attention must be given to make each cutout fit exactly into the 6 stencil type puzzles. Differences in shapes and positions in space make the noting of details essential.

Rubber Kindergarten Balls Chi A,B,C

5″ Ball	8A 275	$1.50
6″ Ball	8A 276	$1.75
7″ Ball	8A 277	$2.00

Rubber balls printed with red, white, and blue designs.

Sandpaper Letters Vit F,G

Lower case manuscript	48A	$29.00
Capitals, manuscript	48B	$29.00
Lower case cursive	48C	$29.00
Capitals, cursive	48D	$29.00
Number Set (1-10)	52	$12.50

Large sandpaper figures mounted on tempered masonite. Child traces rough sandpaper figures.

Seated Parquetry Set APH 1-0365 $11.00 D,E

Developed for low visioned children to provide formboards which control the work space and hold individual pieces seated even if elevated at an angle of considerable degree. 10 stimulus cards and their 10 accompanying seated formboards require students to actively use their vision, but allow better posture than might be maintained otherwise. 144 pieces of tactilmat—non-toxic, non-breakable, washable—consisting of 24 pieces each in 6 different colors: red, yellow, blue, green, purple, and brown. Each color includes 4 pieces each of 6 different geometric shapes: square, right triangle, rectangle, acute isosceles triangle, obtuse isosceles triangle, and rhombus or "diamond".

Self-Care Sequential Cards Dlm 468 $3.25 E

4 sequences of 6 cards each: brushing teeth, washing hands and face, showering, and dressing. Each of the 24 cards measures 3″ × 4-3/4″.

Self-Checking Safety Poster Cards Hol KB5001 $3.80 D,G

24 2-color, 2-part poster cards printed with 24 safety and

public information signs. Students match pictures of signs to corresponding words and explanations. When correct, dots line up.

Sequence Bingo Tre T-099 $4.95 G

Lower case letters are paired in common reading combinations and reversals.

Sequential Cards—Health and Safety

Dlm 408 $3.50 E

This 4-theme series with 6 cards each reinforces proper health and safety procedures. The colorful 5-1/2″ × 6″ cards illustrate common situations: bicycling, barbecuing, washing dishes (breaking a glass), and outdoor playing.

The Sequential Memory Training Kit

Hol TW9000 $65.00 F,G

Kit consists of hardwood and stand and 60 letter, number and color chips stored in base. Double-sided chips may be inserted from the front or rear of stand; children may work alone or in pairs. One child chooses chips, inserts them in desired sequence, then exposes the sequence by opening the doors. When doors are released, they automatically close and hide sequence from front view. Other child tries to recall sequence.

Extra set of Sequential Memory Chips TW9001 $12.50

Includes 60 chips.

Sequential Thinking Concept Cards Program

Hol E

Sequence Cards Set 4 REF14 $5.95

30 cards in 5 card sequences.

Sequence Cards Set 5 REF15 $8.95

60 cards in 6 to 8 card sequences.

Whole Program (Sets 1-5) REF7X $32.50

This 5-box program of sequencing cards helps children master concepts step-by-step.

Shape Analysis Cards Tea 81-145 $7.95 D

2 decks of cards, 18 pairs each. 1 card in each pair presents a random arrangement of 3 shapes in varying sizes. The matching card shows the same shapes in the same size, but regrouped into a structured design. Deck 1, in blue, is more difficult than Deck 2, which is green. Guide.

Shape-Animals Tre T-716 $3.95 D

11 beastly characters conspire to camouflage some basic geometric shapes. Figures range to 27″. Shapes are incorporated into picture.

Shape Beanbags Tea 16-300 $11.95 C

9 vinyl beanbags, 4″ across in 3 colors: red, blue, and yellow and in 3 shapes: circle, square, and triangle. Activity guide included.

Shape Board APH 1-0371 $13.00 C,D

Consists of a tray with 3 rows of 5 pegs each, on which are hung flat pieces (1/8″ thick) of 5 different shapes, and of 3 relative sizes — large, medium, and small. The outside measurements of the tray are 22-1/2″ × 14-1/2″, with a ledge around the edge 3/4″ wide × 3/4″ deep, thereby providing a working space 21″ × 13″, with total weight of tray 2-3/4″ lbs. The fifteen pegs are approximately 3/4″ high.

5 different shape forms are included: Circles, triangles, squares, rectangles, and pentagons (five sided). For each shape, 5 pieces are provided, 1 each of the large and small sizes, and 3 each of the medium size. While all pieces are painted a flat grey on the back, all those of a particular shape are painted the same color on the front—the circle, blue; the triangle, bronze; the square, orange; the rectangle, red; and the pentagon, yellow. The front and back surfaces of all shapes are constant to the touch.

Shape Disks Nas SA869J-2105 $5.25 C

4 basic shapes, presented in 8 bright colors. 32 2-3/4″ diameter disks, each containing a single fit-in square, diamond, triangle, or circle. All are 3/16″ thick and of crepe foam rubber (Lauri's Tactilmat) material.

Shape-Matching Strip Books Tea 81-125 $10.95 C

8 books. Books 1-4 increase in difficulty from solid shapes of the same size to mixed solid and outline shapes of different sizes. Books 5-8 match missing parts to incomplete wholes and different shapes divided into an equal number of parts. Guide.

Shape Stamps Tea 81-450 $9.95 C

10 rubber stamps with easy-to-grip handles. Clear plastic handles make shapes visible from above. Shapes: circle, triangle, square, oval, rectangle, diamond, hexagon, X, star, asterisk. Guide.

Shaperino Chi 8L 701 $2.50 C

4 puzzle cards and spinner. Child matches shapes to board according to shape shown on spinner. Cardboard. For independent or group play. 4″ × 5″ boards.

Shapes, Colors, and Forms Chi 8M 223 $7.95 C

3 basic shapes (circle, square, triangle) in 3 primary colors, 4 sizes for each shape. Wood box with cover holds tray into which raised forms fit. Board is 7-1/4″ × 9″.

Shapes Dominoes Dlm 244 $3.60 D

36 cards of heavy board printed with 8 mathematical shapes: circle, oval, square, rectangle, diamond, hexagon, isosceles triangle, and equilateral triangle. Blue dominoes, printed in white.

Shapes Puzzles Dlm 103 $5.75 E

12 puzzles, printed in color on sturdy board. The 8″ × 8″ puzzles show geometric shapes cut in different ways. The pieces are large and easy to handle. Instructions are included.

Shapesters Tre T-703 $3.95 D

5 sporty athletes, each composed of a single basic geometric shape, join their composite-shape coach to make a team of figures. Figures range to 23″.

Shoelace Aid APH 1-0380 $7.50 C

The Shoelace Aid consists of a wooden frame shaped like a high-top shoe, but open at the back so foot can be put into it, with 2 vinyl-coated-cloth lacing flaps with 4 eyelets on each side, plus two kinds of laces. The overall dimensions of the shoe are 5″ high × 8-1/4″ long × 3-3/4″ wide. Inside measurements are 4-7/8″ high × 8-1/4″ long × 3-1/4″ wide—big enough to take a size 13-1/2″, D-width, thick-soled child's shoe. The wooden part of the shoe is painted a bright blue, with the vinyl-covered-cloth flaps approximately the same color. The eyelets are made of white metal and have holes 1/4″ in diameter. 2 laces are provided: (1) Made of white nylon cord, 1/8″ in diameter × 43″ long, with 1 smooth and 1 textured tip, each 1-3/16″ long; (2) a regular white knitted cotton shoelace, 1/4″ wide × 40″ long, with regular tips. Brochure suggests teaching guides.

Signs and Symbols Mil MB 7583 $4.00 D,G

56 4-color flash cards offer the meaning and probable location of each sign or symbol. Discussion questions included on each 8″ × 4-3/4″ card.

Sorting Card Set Tea 81-165 $6.95 D

6 decks of cards illustrate animals, children, familiar objects, and geometric shapes and patterns. Each deck has a different background color and consists of 27 cards, 9 sets of 3. Each deck can be sorted in different ways. Guide.

Sound and Symbol Puzzles Dlm 572 $9.95 G

Illustrations of common objects appear on 2 heavy 12″ square board puzzle bases. Students match puzzle pieces with 1 letter of the alphabet (small and capital)—to object that begins with that letter. Boxed. Instructions.

Space Wheels Chi 8M 144 $5.95 B

Features curves rather than straight lines. The large size pieces of durable transparent polystyrene are precision molded in trefoil shapes. The shapes fit together in either a flat plane or at a variety of angles, and the 6 different colors combine to produce patterns of light. Each piece has 9 connection slots along its circumference. 24 pieces total.

Sparring Bags Nas A,B

36″ high bag	SA7440J-SB1	$102.50
48″ high bag	SA7441J-SB2	$108.75

20 gauge vinyl tube, rugged vinyl coated nylon cover. Speed of return is controlled by adjusting the amount of sand through a zipper opening at the bottom.

Spatial Orientation and Sequencing Board

Dlm 173 $26.50 B

The maple board has 50 holes (5 rows of 10 each) in which the student places or removes a peg and a ring. The 22″ × 12″ board has 2 removable legs and may be used flat or in semi-vertical positions of 30° or 60°. There are 55 white plastic rings and 60 2″ wooden pegs in 5 colors. Teacher's manual.

Spatial Relation Cards—Circus Dlm 535 $2.00 D

30 full-color cards, 2-3/4″ × 4-1/2″, depict circus animals and people in various settings and varying positions in relation to another thing. (behind, in front of, in, on, under, next to)

Spatial Relation Picture Cards Dlm 125 $1.75 D

30 full-color picture cards depict spatial relationships of 5 different objects: bed, chair, cup, garage, wagon. Each of the groups depicts 6 different spatial relationships of the object: in; on or on top of; behind or in back of; in front of; under; and by or beside. 2-3/4″ × 4-1/2″ cards of varnished stock. Instructions.

Sprocketeer Chi 8M 573 $34.95 B

Set includes 134 plastic pieces. Flexible rods, in 4 different lengths, bend to form curved constructions. Pieces come in 4 different colors: blue, red, yellow, green. A durable plastic storage container is provided.

Square Peg Board Vit 602 $18.50 C

Peg board featuring square pegs painted in 5 colors. Board has 20 square holes. Pegs are large for easy grasping.

Square Shape Box Vit 4314 $5.95 C

18 shapes fit into the shapes in the removable lid. Made of bright colored nontoxic plastic.

Stacking Pup Chi 8J 658 $9.95 B,C

This pup pulls completely apart—legs, tail, body, even nose—into 13 brightly colored wooden pieces. Fitting it together in correct sequence is a challenge. 6″ long.

Stencils Dlm D

Animal Stencils 105 $4.50

Sitting rabbit, lying rabbit, baby chick, flying bird, turkey, dog, lamb, rooster, fish, cat, pig, hen.

Farm and Transportation Stencils 106 $4.50

Walking man, running man, car, silo, barn, tractor, house, semi-truck, train engine, sailboat, airplane, and jet.

Seasonal Stencils 107 $4.50

Objects associated with seasons: egg, pumpkin, bell, Christmas tree, flag, shamrock, ice-cream cone, heart, heart, snowman, tulip, maple leaf, and Santa Claus.

Shape Stencils 104 $4.50

Includes square, circle, obtuse triangle, 5-pointed star, crescent, bar line, semicircle, diamond, rectangle, 6-pointed star, equilateral triangle, oval.

Each set includes 12 8-1/2″ × 8-1/2″ stencils, mounted on poly-coated boards, and the cutouts, which may be drawn around. Instructions for each.

Storybook Puzzles Chi E

Hey Diddle Diddle—9 pcs.	8Z 677	$3.30
Jack Sprat—14 pcs.	8Z 682	$3.30
Little Boy Blue—14 pcs.	8Z 683	$3.30
Little Red Riding Hood—13 pcs.	8Z 679	$3.30
Peter Peter Pumpkin Eater —14 pcs.	8Z 678	$3.30

The Three Bears—14 pcs.		8Z 680	$3.30
Three Kittens—14 pcs.		8Z 681	$3.30
Three Little Pigs—14 pcs.		8Z 676	$3.30

Each puzzle is 9″ × 12″.

String Along Dlm 383 $12.50 C

Included are 24 patterns, one on each side of 12 cards: a 72″ lace; a 9-1/4″ × 9-1/4″ board; and safely-rounded metal eyes. Students place a pattern card on the board and follow the threading order indicated by the pattern, passing the lace through the metal eyes.

String Along Advanced Patterns Dlm 383A $7.95 C

24 advanced patterns on 12 cards (9-1/4″ × 9-1/4″) have a red design superimposed on a black design. Student threads the designs with 2 72″ laces: 1 red and 1 black. Laces and instructions are included.

Subtle Differences Matching Cards Hol E

Match the Doll Cards	LCG1107	$3.50
Match the Face Cards	LCG1106	$3.50
Match the Puppy Cards	LCG1105	$3.50

Students match pairs of cards distinguishing subtle differences. 12 pairs per set.

Sun-and-Stars Wind Chimes Abb 03604 $35.00 A

15″ diameter wood-grain finish polyester circle. Porcelain chimes in shapes of stars and moons.

Survival Signs Dlm 505 $7.95 D,G

44 signs on both sides of heavy board cards, 18″ × 5″, 12″ × 5″, or 11″ × 11″. No Dogs Allowed, No Smoking, No Minors, Emergency, Fire Escape, Construction Zone, Next Window, Escalator, Fire Alarm, No Diving, Fire Extinguisher, Yield, Bus Stop, Beware of Dog, External Use Only, Up, Down, Customer Service, Gas, Walk, Wet Paint, Lost and Found, Dead End, First Aid, Post Office, Elevator, Warning, Combustible, Out of Order, Taxi, Nurse, Detour, Private Property, No Dumping, No Loitering, No Swimming, Not for Internal Use, Keep Off the Grass, Hospital Zone, Employees Only, Lifeguard, Handicap Symbol, Police, and High Voltage. Instructions.

Survival Signs Hol ID6059 $7.95 D,G

40 double-sided cards provide 80 survival signs to help students learn to function safely and effectively in the community. Words and symbols are accurate representations of real-life signs. Set of 40 cards and teacher's guide.

Swing 'n' Fling Chi 8A 554 $8.95 B

A tossing game which can be played indoors or out. 2 circular targets and 4 weighted "birdies" with handles are included.

Symmetrical Block Designs Tea D

Level 1—40 pattern cards (5″ × 8-1/2″). 82-120 $5.95

Level 2—36 pattern cards (5″ × 8-1/2″). 82-125 $5.50

Children duplicate printed grids with colored cubes to form symmetrical designs. One part of grid shows pattern; other part is blank for child to fill in with cubes. Each set includes blank grids for making child's own patterns. Each set has guide. See *Colored Cubes*, Tea 82-110, for cubes.

Teddy Bear Bingo Col MB 7214 $5.25 D

4 sets of bingo cards with 16 colored circles on each card, 64 colored plastic teddy bears and a spinner with extra large arrow. Colors: red, yellow, blue and green. Instructions.

Ten Spot Game APH 1-0892 $27.50 H

The Ten Spot Game board has both braille and large print. 4 pegs are included with the game. Designed for both visually handicapped and sighted children and may be played by 2, 3, or 4 players. The game reinforces addition concepts while providing practice of abacus skills for visually handicapped students. The object of the game is to be the first one to land on spaces whose numbers sum to 10.

Tens Col 956 $3.00 F

Youngsters make patterns of colored numbered triangles, which must add up to 10. 72 pieces. Up to 5 players.

Textured Matching Blocks APH 1-0895 $13.00 C

Permits tactual matching of textures, recognition of types of textures, and identification of textures by name. The child matches 6 textured blocks with identically textured nests which hold the blocks. A board containing 6 recessed nests is cushioned to prevent scarring of surfaces and to avoid slipping on smooth surfaces. Each of 6 squares has a different texture to be matched to textures in bases of nests.

Related Manual: Barraga N., Dorward, B., & Ford, P. *Aids for Teaching Basic Concepts of Sensory Development.* c. 1976. APH 7-225 $3.65

Textured Pegs I APH 1-0893 $10.00 C

Related Manual APH 7-0225 $3.65

Board contains 12 holes for textured pegs in 3 horizontal rows and 4 vertical rows. Pegs are large to allow development of fine motor skills and increase manual dexterity.

Related Manual: Barraga N., Dorward, B., & Ford, P. *Aids for Teaching Basic Concepts of Sensory Development.* c. 1976. $3.65

Things and Places Beginner's Inlay Chi C

Buildings We See—4 pcs.	8Z 690	$3.30
Childrens' Pets—5 pcs.	8Z 687	$3.30
Farm Animals—5 pcs.	8Z 688	$3.30
The Farm Yard—6 pcs.	8Z 691	$3.30
Fruits—6 pcs.	8Z 689	$3.30
Transportation—5 pcs.	8Z 685	$3.30
Vegetables—6 pcs.	8Z 686	$3.30
Zoo Animals—5 pcs.	8Z 684	$3.30

Lacquered wood boards measure 11-1/2″ × 9-1/2″, into which single inset pieces are placed for each thing or place. "Fruits", for example, consists of pear, tomato, orange, banana, strawberry, and a bunch of grapes.

Threading Board Dlm 370 $5.25 B

The red wooden board has 10 3/4″ holes, and comes with a 48″ lace and a 7″ wooden threader.

Threading Sequence Chi C

Single Bend	8E 106	$9.95
Four Bend	8E 107	$9.95
Spiral	8E 108	$10.95
Bracelet	8E 109	$5.95

The first 3 are wire frames mounted upright on 3 wooden boards while the Bracelet is not mounted. Threading wooden shapes on and off the wire frames becomes increasingly complex, as the names imply.

3-D Fit-A-Letter Nas F,G

Capitals	SB857J-2315	$13.50
Lower Case Letters	SB858J-2316	$13.50
3-D Fit-A-Number	SB859J-2324	$5.50

3/8″ thick frames and many letters will stand upright. Rubber.

Three for the Road Chi 8B 541 $5.95

Three vehicles: taxi, ambulance, fire chief, made of durable plastic, 5-3/8″ × 2-1/8″. Wheels do not come off.

Touch to Learn Beaded Clock Ide CE 2495 $8.95 H

13-1/4″ diameter clock face with raised, touch beaded surface on numerals and minute markings. Provided with easel back grommet for hanging.

Tracking Association Cards Dlm 417 $7.25 C

9 double sided 7-1/2″ × 11″ coated cards, marking pencils, and cloths for wiping the cards clean are included, along with instructions. 18 tracking tasks on the cards include following oral directions or students may choose any track between 2 objects and verbalize the movement of the pencil.

Traffic Safety Puzzle Chi 8Z 736 $4.95 D,G

Knobbed, inset puzzle. Each of 5 pieces represents a traffic sign each child should know. Lacquer-finished masonite. 8-3/4″ × 11-3/4″. Colored.

Traffic Sign Cards Mil MB 7303 $5.40 D,G

30 (9-1/8″ ×11″) picture cards. Colored illustrations portray a variety of traffic signs and signals in natural roadway settings. Guide.

Traffic Signs Sem D,G

Safety Signs	1185	$28.95
Table Top Traffic Sign Sets	1180	$3.95
Traffic Signs	1190	$28.95

Replicas of official highway signs. Wood. Base: 3/4″ × 16″ × 16″. 42″ high.

Traffic Signs and Symbols Mil D,G

Miniature Traffic Signs PS 312 $10.00

10 basic 3-piece signs and traffic light. Approx. 7-1/4″ tall. Disassembles for storage.

Traffic Symbols PS 587 $36.65

6 3-piece wood traffic symbols, 30″ tall with bases. Can be disassembled.

Above include stop sign, do not enter sign, one way, yield and symbols for bicycle, stop, railroad, pedestrian walk, curved road, two-way, no left turn, no bicycles, pedestrian traffic.

Tube Stacker Nas SB578J 1425 $13.95 B

Flexible plastic tubes for stacking of balls in 5 colors: white, green, yellow, red, and blue. Each group of balls is color keyed to a stacking tube. Proper tube is also designated by number.

Twist 'N Turn Hol LCK 287 $4.75 B

3 different shapes for children to grip, turn and screw onto threaded plastic rod. Colorful. 6-1/2″ long.

UNO Cards local price varies F,G

A card game designed to enrich number, letter, and color recognition skills. Game includes 108 UNO cards, 0-9 cards, Reverse, Wild, Skip and Draw 4 Cards. All colored in 1 of 4 colors: green, blue, red, and yellow. 2-10 players. Rules.

Verb Puzzles Dlm H

English version	410	$5.25
Spanish version	832	$5.25

48 Verb Puzzles. Top section of each pictures people demonstrating action words; bottom shows corresponding verb. Pieces interlock only if they belong together. For students of varying ages. Suitable for individual or group use. Heavy boards, 3″ × 4-3/4″, are printed on both sides and boxed. Instructions included.

Versa-Tiles Nas SB820J-265D $22.00 C,D

18 pieces: 6 each of circles, squares and triangles. Perimeter-punched with 3/8″ holes for pegging or lacing. Complete range of primary and secondary colors in each shape. Circles are 8-1/2″ diameter. Washable 3/16″ thick crepe foam rubber. Suggested activities in English, Spanish and French. Pegs and laces not included.

Visual Closure Cards Ide CE 6056 $3.25 E

18 sets of cards, 2-7/8″ × 3-1/2″, with drawings of commonly recognizable objects. 1 card in each set shows a complete drawing, while the other shows a broken pattern of the same drawing.

Visual Closure Hidden Picture Activities

Col MB 7202 $10.50 E

This set of 16 11″ × 9″ and 16 5-1/2″ × 9″ task cards introduces or reinforces concepts of visual closure. Activities are developmental in progression and self-checking for immediate reinforcement of correct responses. Both single closure and hidden closure are incorporated and sequenced by level of difficulty in 20 pages of Duplicating Master extension activities. Teacher directions are included.

Visual Discrimination and Perception

Tre D,E

Design Copying Cards, Level 1	T-137	$3.95
4 designs with copying space under each design.		
Draw What's Missing	T-210	$3.95
Cards with 12 familiar figures with parts omitted.		

External Differences, Level 1 T-142 $3.95
Match objects in rows.

Finding Pairs T-175 $3.95
Match objects in different columns.

Finish the Picture, Level 1 T-151 $3.95
Cards contain half a figure, with space for finishing.

Finish the Picture, Level 2 T-124 $3.95
Same as above.

Hidden Pictures in American Folklore T-162 $3.95
6 hidden objects on each card.

Left-Right Recognition, Level 1 T-127 $3.95
Objects facing left or right are paired to words *left* or *right*.

Left-Right Recognition, Level 2 T-128 $3.95
Columned objects facing left or right are paired to printed words.

Pattern Repetition, Level 1 T-138 $3.95
Basic shapes in pairs create patterns. Space to continue patterns.

Same or Different T-167 $3.95
Rows contain a key item plus 3 others for matching same or different objects on board.

Wipe-off cards. 12 8-1/2″ × 11″ cards in each set. Plastic coated.

Visual Discrimination Learning Lab Hol XR5510 $29.95 F,G,H
Students follow the cassette directions to complete 4-page activity booklets. Skills include shape recognition, spatial orientation, visual closure, letter and word recognition. Consists of 3 cassettes, 90 activity booklets (30 for each lesson) and 3 reproducible post-tests.

Visual Matching, Memory, and Sequential Exercises
Dlm F,G,H

Books 1, 2, 3 330 $22.25
Book 1—Color matching, memory, and sequencing.
Book 2—Black-and-white matching, memory, and sequencing from 1 to 3 figures.
Book 3—Black-and-white shape and design matching, memory, and sequencing with superimposed designs.

Books 4, 5, 6 331 $22.25
Book 4—Matching, memory, and sequencing capital- and lower case printed letters.

Book 5—Matching, memory, and sequencing manuscript capital and lower case letters.
Book 6—Matching, memory, and sequencing capital and lower case script letters.

Books 4, 5, and 6 are a set designed for beginning readers, with a basic vocabulary of 2-, 3-, and 4-letter words.

Books 1-6 332 $42.50

A 6 book series provides developmental exercises that train students to match colors, figures, shapes, designs, and letters visually from memory. Each of the books has from 3 to 6 parts in which the exercises follow the steps of perceptual development. The books measure 7″ × 7″, are constructed of heavy stock, and are spiral bound. The coated fold-over flaps are used by students to go from matching to memory. Each set of 3 books is separately boxed and is available as a total program.

Visual-Motor Template Forms Tea G

Template Forms 35-530 $20.00
Erie Program Part 3. 6 student workbooks, 6 eraser pencils, guide.

Additional Template Forms 35-535 $6.75

Each book includes 2 sets of templates and 14 worksheet exercises emphasizing 6 geometric shapes. The child first traces the shapes with the templates, using an eraser pencil. Additional tracing is done with regular pencil. Guide.

Visual Perception Big Box Dlm 348 $83.50 D,E

Includes all of the following:

Activity Cards (140 cards)	348A	$16.50
Association Picture Cards III	157	$3.50
Basic-Cut Puzzles I	341	$5.75
Clear Stencils	137	$8.00
Eye-Hand Integration Exercises I	315	$7.75
Halves to Wholes Cards	305	$2.50
Large Parquetry (2 sets, plastic)	500	$5.25
Large Parquetry Designs	114	$4.25
Multimoes	236	$2.50
Multivariant Sequencing Beads	289	$10.00
Multivariant Sequencing Bead Patterns	290	$3.50
Sequential Picture Cards I	127	$1.75
Sequential Picture Cards II	161	$3.50

Size Sequencing Cards	288	$2.75	
Sorting and Grouping Tray	286	$3.25	
Symmetrical Match-Up	292	$1.85	
Visual Discrimination Flip Books I	308	$2.25	
Book II	309	$2.25	
Book III	310	$2.25	
Visual Memory Cards I	181	$1.75	
Visual Memory Cards II	181B	$2.75	

140 activity cards help teacher pinpoint problem areas of visual learning: color, shape, and size; closure; discrimination; eye-hand coordination; and visual language concepts.

Visual Perceptual Games Tea 35-510 $29.95 C,D

5 different game boards are each used by 2 players moving along a route marked by geometric shapes. Moves are determined by dice with colored shapes, spinners with colored shapes or black outline shapes, or plastic tactile shapes. The boards increase in difficulty from color-cued shapes to no color, color as a distractor, distracting background, and broken outline shapes. Guide.

Visual Sequential Memory Exercises

Dlm 284 $18.50 F,G,H

Developed by the education staff of the Marianne Frostig Center of Education. They progress from geometric shapes through manuscript and cursive letters to actual words. The spiral-bound 8-1/2″ × 11″ pages are on heavy, coated stock. The vinyl cover has fold-out flaps. Includes 30 visual memory exercises. Detailed directions are included.

We Dress for the Weather Nas S8758J-285 $9.95 C

57 pieces of flannel board cutouts include boy, girl, thermometer, weather symbols, word cards, and clothing for all kinds of weather. Appropriate dress for today's weather is the approach to the learning and manipulation situations. Weather conditions and the days of the week are included in the materials.

What Comes Next? Hol F

Flip-View Display Stand	TW10	$37.50

Hardwood & plexiglass, with 7 flip-view doors. 23″ long.

Alphabet Visual Closure Program Strips.	TW14	$19.75

52 strips, 1 for each capital and lower case letter.

Blank Make-Your-Own-Sequence Strips	TW15	$7.50

Letter/Number Logical Sequence Program Strip — TW12 — $10.00

25 strips use letters & numerals in different combinations to form logical sequences.

Size, Shape & Position Program Strips (25) — TW11 — $10.00

Story Sequences Program Strips — TW13 — $10.00

25 strips present humorous action sequences. Graduated in difficulty.

What Follows, Set I — Mil — MB 7705 — $4.00 — E

These 16 activities provide practice in logical thinking. Illustrated situations offer a basis for choosing causes or outcomes and sequencing and matching people or objects with events. Activities gradually increase in complexity.

What Follows, Set II — Mil — MB 7706 — $4.00 — E

A follow-up unit to Set I. Illustrated situations offer a basis for recognizing illogicalities, choosing causes or outcomes and sequencing. Activities gradually increase in complexity.

What's Missing? — Tea — E

Level I — 85-210 — $8.50

32 cards present simple line drawings of common objects, animals, and people. Each drawing has 1 or more details missing. Cards are plastic laminated so the children can fill in the missing part with a crayon; markings may be wiped off with a soft cloth. Card size 8-1/4″ × 5-1/2″. Guide included.

Level 2 — 85-215 — $6.25

Entire scenes are shown from which a number of objects or elements are missing. Contains 24 picture cards that are 8-1/4″ × 5-1/2″. Guide is included.

What's Wrong Here? — Tea — E

Level I — 85-230 — $8.95

Each of the scenes on these 15 picture cards (8-1/2″ × 11″) includes 4 or more incorrect details ranging from blatant absurdity to inappropriateness within a scene. A newly revised guide is included.

Level II — 85-235 — $9.50

Designed for older students, the absurdities and errors in the 16 picture cards (8-1/2″ × 10″) are more subtle and less ridiculous than those shown in Level I. A guide is included.

Where Is It? Spatial Relationship Cards

Ide ID 2684 $3.25 D

6 sets of 6 cards each, showing spatial relationships: on, behind, right, left, under, in front of. Cards are 3-1/2″ × 4-9/32″. Instructions.

Wooden Constructo Sets APH C

Junior Kit — 38 pcs.	1-0369	$28.00
Senior Kit — 151 pcs.	1-0314	$87.50

These Constructor Sets consist of various lengths of hard wood with holes bored at regular intervals and a quantity of wooden bolts and nuts. The Junior Constructor Kit, packed in a storage box 24″ × 5-1/4″ × 5-1/4″, has a woven strap carrying handle. The Senior Kit is in a storage box measuring 33″ × 11″ × 7″ and provides for more elaborate activities. The accompanying brochure offers suggested projects for the use of the teacher. Both kits are sold in complete sets only. However, replacement parts are available.

Wooden Train Vit W7650 $19.95 B

The engine and 2 railway carriages are made of cubes, circles, rods, and balls that can be screwed and unscrewed. Bright primary colors are used.

Word Matching Flip Books Dlm 338 $11.75 H

Each of 200 basic vocabulary words appears in a book 3 times: printed on top; manuscript in middle; and cursive on the bottom. After flipping to match up word-cards, student says the word and writes it. The 11-book series includes 1 book of 2-letter words, 2 books of 5-letter words, and 1 book of words over 5 letters. Books are 3-1/4″ × 6″. Instructions.

Word-Picture Dominoes Dlm H

Phonics 219 $2.95

Student matches picture with another picture, or with printed name. 28 1-3/4″ × 3-1/2″ pieces on superboard present 7 words containing short vowels and blends *st, dr,* and *tr*. Instructions.

Sight Words 220 $2.95

7 words (horse, house, girl, bird, dog, and car) to recognize. Students match picture with another or with printed name. 28 1-3/4″ × 3-1/2″ pieces.

Combined set of 219 and 220 504 $5.50

Workbench Nas SA2016J-300 $7.95 B

Teaches the student how to handle tools, the threading and placement of screws, nuts, bolts and nails. The Playskool Workbench is a complete take-apart. Size 11-1/2″ × 5-1/2″.

Workbench Chi 8M 537 $8.95 B,C

This wooden bench allows the child to pound nails, turn bolts, use a screwdriver, and work with a vise. Tools store in a rack. Colors are nontoxic.

Writing Exercises Shm G

Let's Write Series, Book I H-SE104 $4.25

Manuscript writing guides.

Let's Write Series, Book 2 H-SE105 $4.25

Cursive writing guides.

Let's Drill H-SE133 $4.25

Cursive writing book. Exercises. Includes all letters, writing colors and numbers, linking letters, building letters into words, sentences, letter writing, addresses. Fun pages. Guide. For spirit or liquid machines.

Writing Paper (Overlay-Manuscript) H

APH 1-0478 per lb. $0.90

Printed in black ink on white, 50-pound, standard finish paper, 8-1/2″ × 11″ in size with lines running the long way. 3 sets of lines of 4 lines each. The lines of each set are 1/2″ apart, and are arranged with 2 lightface lines above and 1 lightface line below the heavy bold line, which indicates the base line for writing. The lightface line immediately above the base line sets the limit for the height of the body of lower case letters. The top lightface line and the lightface line below the base line set the limits for the ascenders and descenders of certain letters. The heavy base line and the top lightface line set the limits for all capital letters. A 1-lb. package contains approximately 100 sheets each with an overlay of manuscript lower case letters for copying.

Writing Paper (Overlay-Cursive) APH 1-0477 per lb. $0.90 H

Same as "Manuscript" except for "Cursive."

Source List

Code	Full Address
Abb	Abbey Press Hill Drive St. Meinrad, Indiana 47577
Abc	ABC School Supply, Inc. 437 Armour Circle, N.E. P.O. Box 13086 Atlanta, Georgia 30324
Ame	American Guidance Service Publishers' Building Circle Pines, Minnesota 55014
APH	American Printing House for the Blind 1839 Frankfort Avenue Louisville, Kentucky 40206
Bor	Borg-Warner Educational Systems 600 West University Drive Arlington Heights, Illinois 60004
Chi	Childcraft Education Corporation 20 Kilmer Road Edison, New Jersey 08817
Chp	Children's Press 1224 West Van Buren Street Chicago, Illinois 60607
Col	Cole Supply P.O. Box 1717 Pasadena, Texas 77501
Did	Didax Potpourri School Products 114 West Broadway Maryville, Tennessee 37801
Dlm	Developmental Learning Materials 7440 Natchez Avenue Niles, Illinois 60648
Edm	Edmund Scientific Co. 3977 Edscorp Building Barrington, New Jersey 08007
Edu	Educational Performance Associates, Inc. 600 Broad Avenue Ridgefield, New Jersey 07657
Fis	Fisher-Price Toys 70 Church Street East Aurora, New York 14052
Gam	Gamco Industries P.O. Box 1862 K Big Spring, Texas 79720
Hol	J. R. Holcomb Company 3000 Quigley Road Cleveland, Ohio 44113
Icm	Instructor Curriculum Materials P.O. Box 6177 Duluth, Minnesota 55806
Ide	Ideal School Supply Company 11000 South Lavergne Ave. Oak Lawn, Illinois 60453
Ins	Instructo/McGraw Hill Paoli, Pennsylvania 19301

Code	Full Address
Int	International Games, Inc. 457 N. Ottawa Street Joliet, Illinois 60431
Kim	Kimbo Educational P.O. Box 477 Long Beach, New Jersey 07740
Lau	Lauri Phillips-Avon, Maine 40966
Lea	Learning Discoveries Wynnewood, Pennsylvania 19096
Maf	Mafex Associates, Inc. 90 Cherry Street P.O. Box 519 Johnstown, Pennsylvania 15907
Mbn	Miller-Brody/Newbery, Inc. 342 Madison Avenue Dept. D79 New York, New York 10017
Mil	Milton Bradley Company Springfield, Massachusetts 01101
Mod	Modern Education Corporation P.O. Box 721 Tulsa, Oklahoma 74101
Nas	NASCO 901 Janesville Avenue Fort Atkinson, Wisconsin 53538
Sco	Scott, Foresman and Company 1900 East Lake Avenue Glenview, Illinois 60025
Sem	Special Education Materials, Inc. 484 S. Broadway Yonkers, New York 10705
Shm	Frank Schaffer, Hayes, Milliken et al. Potpourri School Products 114 West Broadway Maryville, Tennessee 37801
Tea	Teaching Resources Corp. 100 Boylston Street Boston, Massachusetts 02116
Tre	Trend Enterprises Inc. P.O. Box 3073 St. Paul, Minnesota 55165
Vit	The Vital Years Educational Teaching Aids 159 West Kinzie Street Chicago, Illinois 60610

Sources of Magnifiers

Descriptive brochures and/or catalogs may be obtained from these sources. Purchases may be made directly from them or through their local distributors. Brochures and catalogs contain identifying pictures and details of the components of magnification and design.

American Optical Corporation, Inc., Optical Products Division, Southbridge, Mass. 01550. Ask for catalogue of low vision aids.

Apex Specialties Company, 1115 Douglas Avenue, Providence, R. I. 02904.

Bausch & Lomb, Inc., 635 St. Paul St., Rochester, N.Y. 14602. Catalogue of hand magnifiers.

Covington Plating Works, Inc., 331 Pike Street, Covington, Ky. 41011.

Designs for Vision, Inc., 40 East 21st Street, New York, N.Y. 10010.

Distributors in community; i.e., school supply houses, opticians, science supply houses.

Donegan Optical Co., 1405 Kansas, Kansas City, Mo. 64127. Catalogue of magnifiers.

McLeod Optical Co., Inc., 357 Westminster St., Providence, R.I. 02905. Magnifiers.

New York Lighthouse for the Blind, Optical Aids Division, 111 East 59th Street, New York, N.Y. 10022. Optical Aids catalogue.

Optical Sciences Group, Inc., 24 Tiburon Street, San Rafael, Calif. 94901.

Selsi Co., Inc., 40 Veterans Blvd., Carlstadt, N.J. 07072. Catalogue of magnifiers and telescopes.

Sam Walters, 412 West Sixth St., Los Angeles, Calif. 90014. Magnifiers.

Appendix II

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Appendix III

Glossary

The following definitions have been adapted for their specific use in this program from the following sources listed in the bibliography: Faye, 1970; Webster's Third New International Dictionary, 1976; Hathaway, 1966; Harley & Lawrence, 1977.

Abstract figure A pattern or configuration which has no specific name as a thing or object and in which lines are arranged so that segments may be perceived as complete figures apart from the whole.

Accommodation A process of adjustment of the eye or changing focus to see things clearly at different distances.

Adventitious Visual impairment acquired because of disease, accident, or trauma after having had some type of visual experience for any period of time.

Albinism A genetic trait characterized by a deficiency in or the absence of pigment cells in the eyes and/or skin and hair.

Amblyopia A condition which occurs when one eye is much stronger than the other, or if the two eyes are not lined up together resulting in a loss of vision not traceable to any disease.

Aniridia Congenital incomplete development and/or absence of the iris of the eye.

Aphakia A condition characterized by an absence of the lens of the eye.

Asthenopia Eye fatigue caused by tiring of the internal and external muscles of the eyes.

Attend Conscious direction of senses for gathering of information to interpret mentally.

Aware Showing heightened perception and comprehension of any stimulus.

Behavior Anything that a learner does that involves action and response to stimulation.

Binocular vision The use of both eyes simultaneously to focus on the same object and to fuse the two images into one for correct interpretation.

Blind Those who have only light perception without projection, or those who are totally without the sense of vision.

Body awareness A conscious appreciation of the relationship of all body segments to each other and to objects as well as the capacity for movement and functioning.

Body image Picture of one's own physical body and its capacity for movement and function.

Brightness Luminous intensity created by the transmission of light through a medium or reflected from a surface.

Buphthalmos Enlargement of the eyeball.

Cataract Cloudiness or opacity in the lens of the eye with consequent loss of visual acuity.

Chorioderemia A genetic defect in which portions of the chroroid and retina are absent.

Chorioretinitis Inflammation of the choroid and retina.

Choroiditis Inflammation of the choroid (the blood vessel layer of the eye) due to infection or allergy.

Coloboma A congenital defect in which a part of the structure of the eye did not complete tissue growth.

Color deficiency Diminished ability of the visual system to perceive differences in color, especially in red or green.

Concave lens Lenses with negative refractive power which diverge the rays of light, and are used to correct a myopic condition.

Concrete objects Actual physical objects which can be experienced tactually and visually as known things.

Cones Light receiving cells concentrated in the central retina, concerned with detail and color discrimination.

Congenital Conditions or abnormalities in the visual system originating during prenatal development and present at birth.

Contrast The relative difference between the lightness and darkness of things observed.

Convergence The aiming of the two eyes toward each other to focus on an object.

Convex lens Lenses with positive refractive power to converge the rays of light and are used to correct a hyperopic condition.

Cum correction (cc) A symbol indicating acuity when wearing prescribed lenses.

Depth perception The ability to perceive the relative distance of objects and their spatial relationship to each other.

Detail Particular elements considered separately and in relation to the whole.

Developmental anomaly An abnormality in body tissue or structure of unknown origin, and occurring before birth.

Developmental gap An omission in a child's pattern of visual function in physical, social, or emotional behaviors.

Developmental lag A slower than average pattern of growth in visual function in either the physical, social, or emotional behaviors.

Developmental milestones Significant points in progressive improvement of the visual system for performance of physical and mental tasks.

Difference Perception of the characteristics which distinguish one thing from another.

Diopter A unit of measurement used to designate the strength or refractive power of a lens.

Diplopia A perception of two images when only one is present.

Discrimination The ability to make distinctions within and/or between visible things.

Eccentric fixation Directing the eye(s) to a point other than the center of the macula.

Embedded figure A figure surrounded closely by many other lines not a part of the central figure(s).

Enucleation Surgical removal of an entire eyeball.

Feature A distinguishing mark or prominent characteristic of a person or object.

Field of vision The extent of physical space visible to an eye held in a fixed position and looking straight ahead.

Figure A collection of connected straight or curved lines representing a definite shape with inner detail.

Figure ground The observed relationship between visible things and the background against which they are seen.

Figure-ground differentiation The ability to discriminate visible things apart from the background.

Fixation Aiming or directing the eye(s) to a specific spot or thing.

Fluorescent lamp A glass tube coated on the inside with a fluorescent substance which produces light when mercury vapor is acted upon by radiant energy. Less head is produced and less electric energy is required than for incandescent lamps.

Focal distance The distance from an object at which a lens will focus clearly.

Focus Adjustment of the eye(s) to converge the rays of light so as to achieve the clearest possible image.

Footcandle A unit for measuring illumination equal to the amount of light thrown by one candle on a square foot of surface every part of which is one foot away.

Fovea The central area of the macula where there is a concentration of cones and at which the clearest, sharpest vision is possible.

Fusion The ability to perceive two dissimilar images seen by each eye into one single mental image.

Geometric figure A two-dimensional representation of a shape.

Glare A quality of relatively bright light which causes discomfort in the eye, or which interferes with visibility and visual performance.

Glaucoma Accumulation of fluid within the eye causing the organic changes and resulting in some loss of visual function.

Hereditary A term used to denote conditions which have a genetic basis and which may be transmitted through dominant or recessive genes from one generation to another.

Identification The act of selecting and/or naming a particular thing.

Illumination The giving of physical light to an area.

Imitate To copy or mimic actions performed by another or represented in pictures.

Incandescent lamp A lamp containing a filament of conducting material in a vacuum which produces light when heated by an electric current.

Inner detail Distinguishing features within a figure or symbol.

Interstititial keratitis Inflammation of the tissues in the inner layers of the cornea.

Iritis Inflammation in the iris which may cause pain, contraction of the pupil, and discoloration of the iris.

Jaeger test Lines of reading matter printed in a series of various print sizes used as a test for near vision.

Keratoconus A conical curvature of the cornea which sometimes may be corrected through surgery.

Lens A transparent refractive medium having one or both surfaces curved.

Light adaptation Adjustment of the eye to variations in the amount of surrounding light.

Light perception The ability to distinguish light from dark.

Light projection The ability to determine the direction of a light source.

Light reception A behavioral or pupillary response to light introduced at or near the eye.

Light reflection Light thrown back from a surface or object.

Line of sight The path along which the eye aims in fixating an object.

Looking The act of using the eye(s) to search for and examine visible things.

Low Vision Vision which gives less than normal acuity (even with correction) at distance and/or at near under ordinary conditions.

Low vision aids Optical devices of various types useful to persons with visual impairment.

Macula The central area of the retina, including the fovea and extending around it, comprising the point of most distinct vision.

Magnification An increase in the perceived size of an object or symbol.

Manipulate To move, manage, and control with the hands while looking.

Microphthalmos Congenital abnormal smallness of the eyeball.

Microscopic aids Lens or combinations of lenses used at near point to enlarge images of very small things.

Miosis Constriction of pupils, related primarily to drugs used to control glaucoma.

Near vision The closest point at which things can be seen clearly.

Night blindness Inability to see in dim light because of abnormal functioning of the rods in the peripheral retina.

Nystagmus Involuntary quivering of the eyeballs symptomatic of neuromotor dysfunctioning.

Object constancy The ability to perceive the sameness of objects regardless of changes in distance, angle of view, and amount of light.

Occipital lobe The back portion of the brain cortex where optic nerve pathways terminate and where visual information is received.

Oculus Dexter (O.D.) Right eye.

Oculus Sinister (O.S.) Left eye.

Oculus Uterque (O.U.) Both eyes.

Ophthalmia neonatorum An acute infection in the eye of the newborn.

Ophthalmic optician A person trained in optical assessment and refraction who works under the supervision of a licensed eye specialist (either an optometrist or ophthalmologist).

Ophthalmologist A medical specialist who treats diseases and gives surgical care to the eyes.

Optic atrophy Deterioration of all or part of the nerve fibers which carry messages from the retina to the brain.

Optical Structures in the eye(s) which permit the control of light rays for seeing.

Optical functions Those skills related to control and use of the external or internal muscles and structures of the eye.

Optician A specialist who grinds and fits lenses, and designs and manufactures optical instruments according to prescription.

Optometrist A specialist in physiological optics and refraction who is licensed as a nonmedical practitioner to examine eyes, prescribe and provide lenses or visual therapy. Referrals to ophthalmologists are made when structural defects or diseases needing medical attention are suspected.

Outline Line(s) that mark only the outer limits of an object or figure and give shape to it.

Part-whole Seeing and perceiving the individual parts combined into an integrated whole.

Pattern A design of integrated parts perceived as a whole.

Peripheral vision Perception of objects, motion or color outside the direct line of sight.

Photophobia Abnormal sensitivity to and discomfort from light.

Photopic Vision attributed primarily to cone function characterized by ability to discriminate colors and small detail.

Picture A representation of real things or actions on paper.

Point A unit of measurement of type size equal to 1/72 of an inch (72 point type = 1 inch).

Position in space The perception of the relationship of an object to the observer or two objects to each other.

Ptosis Drooping of the upper eyelid.

Pursuit movement The ability to fixate a moving object.

Recognition Indication that what is seen is familiar or has been seen before.

Refraction The bending of light as it passes between substances of different densities; the technique of determining the necessary power of lenses to correct abnormalities in the functioning of the eye.

Residual vision Any usable remaining vision which may be present or which can be developed despite severe impairment in some of the structures or tissues of the eyes or in some part of the visual system.

Retina The inner, transparent membrane of the eye containing light sensitive nerve tissue.

Retinal detachment Separation of the retina tissue from the choroid breaking connections of blood vessels and nutrients to nerve cells.

Retinitis pigmentosa Hereditary degeneration and atrophy of the retina beginning in the periphery and resulting in night blindness.

Retinoblastoma A hereditary malignant tumor arising in retinal germ cells usually before five years of age.

Retrolental fibroplasia An accumulation of blood vessels causing scar tissue to form back of the lens; often associated with prematurity and oxygen therapy.

Rods Retinal nerve cells primarily concerned with the perception of light and movement, not sensitive to color or high intensity light necessary for detail discrimination.

Scotoma A blind area or partially blind area in the retinal field.

Scotopic Vision attributed to rod function for the detection of movement in low levels of illumination.

Seeing The process of gathering and understanding information through looking.

Shape The solid form or silhouette of something.

Sine correction (sc) A symbol indicating acuity without correction.

Spatial orientation Perceiving the relative position of self and/or visible things in relation to surrounding space.

Spatial perspective The ability to view objects or a picture of objects in relation to their relative position to each other and their distance for observer.

Spatial relationship The ability of an observer to perceive the position of two or more objects in relation to self and others.

Stereopsis Visual perception of depth and/or three-dimensional space.

Subluxation Displacement of the lens of the eye from the lens capsule.

Subnormal Vision considered to be less than normal in terms of acuity, field of vision or motility, and uncorrectable by conventional spectacles or other aids or techniques.

Symbol A conventional or familiar sign that stands for or suggests something else when seen.

Sympathetic ophthalmia Inflammation of an eye due to injury or infection in the other eye.

Teacher consultant A person with special education training in visually handicapped (low vision) who gives advisory, consultative, or supportive services regarding visually handicapped learners.

Telescopic lenses Magnifying lenses prescribed for low vision persons for distance viewing when ordinary spectacles are not sufficient.

Trachoma A chronic, destructive, and contagious infection in the lining of the eyelids.

Tracking Following with the eye(s) and/or head the movement of visible things with body stationary or in movement.

Tunnel vision Contraction of the visual field to such an extent that only a small area of central acuity remains.

Typoscope Reading slit in dull black cardboard to expose two or three lines of print at a time.

Visibility The extent or degree to which something can be seen clearly by an observer.

Vision The process of looking, seeing, and perceiving through the sense of sight.

Vision specialist Any medical, clinical, or educational person with special knowledge and/or training in working with visually handicapped (low vision) persons.

Visual acuity A clinical measurement of the sharpness and clarity of vision for discrimination of fine details at a specified distance.

Visual association Perceiving a logical relationship between similar concrete, representational, and/or symbolic visible things.

Visual attention Sustained looking at visible objects or pictures.

Visual awareness Knowledge that something visible is present in the visual field.

Visual closure The ability to perceive a total picture when only a portion is visible.

Visual cortex The area of the brain where visual information is received and interpreted for seeing.

Visual cues Any type of visual information which may be used by an individual to orient self in space, move from one place to another, perform any task or function, or to locate a desired place or object.

Visual disability Any limitation of function experienced as a result of visual impairment.

Visual disorder Any pathological condition of the visual system which might be treated medically.

Visual efficiency The degree to which specific visual tasks can be performed with ease, comfort, and minimum time, contingent upon personal and environmental variables.

Visual exploration Careful inspection of visible things or the surrounding environment.

Visual field The area of physical space visible when the body, head, and eyes are in a stationary position.

Visual function Physiological action of the visual system in responding to observed things.

Visual functioning A person's use of vision to perform tasks which require visual orientation. Visual functioning seems to be related to previous experiences, needs and expectations of self and others, and general motivation.

Visual image Mental picture based on the recall of a previous visual experience.

Visual impairment Any optically or medically diagnosable condition in the eye(s) or visual system that affects the development and normal use of vision. Impairments may be of a rather minor nature, may be correctable, or may be quite severe and uncorrectable.

Visual information Knowledge of the environment and the things in it acquired through the visual sense.

Visual memory The storage and recall from past experience of the observer's integrated visual information.

Visual motor The control and manipulation of body movements in relation to what is observed.

Visual perception At a point in time, the ability to understand, interpret meaningfully, and use information received through the visual sense.

Visual stimulation Presentation of visible objects and materials in a consistent and orderly sequence so as to permit and foster visual perceptual development.

Visual system All component parts of the eye, optic nerve, brain, and association pathways which influence looking and seeing.

Visual task Any task performed by looking and using vision to accomplish it.

Visual training The teaching process for improvement in visual functions.

Visually handicapped A generic term used to describe the entire range of individuals who experience difficulty in seeing, or require special adaptations in order to function visually under average conditions, including those who have no usable vision.

Whole-part Seeing and perceiving the whole as an assemblage of unique and individual parts.

Appendix IV

Source of Materials for Vision Reduction Simulations

Press-On (Fresnel) Optics

American Optical Corporation
P.O. Box 1929
Dallas, Texas 75221

House of Vision
137 N. Wabash Avenue
Chicago, Illinois 60602

Bausch & Lomb, Inc.
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